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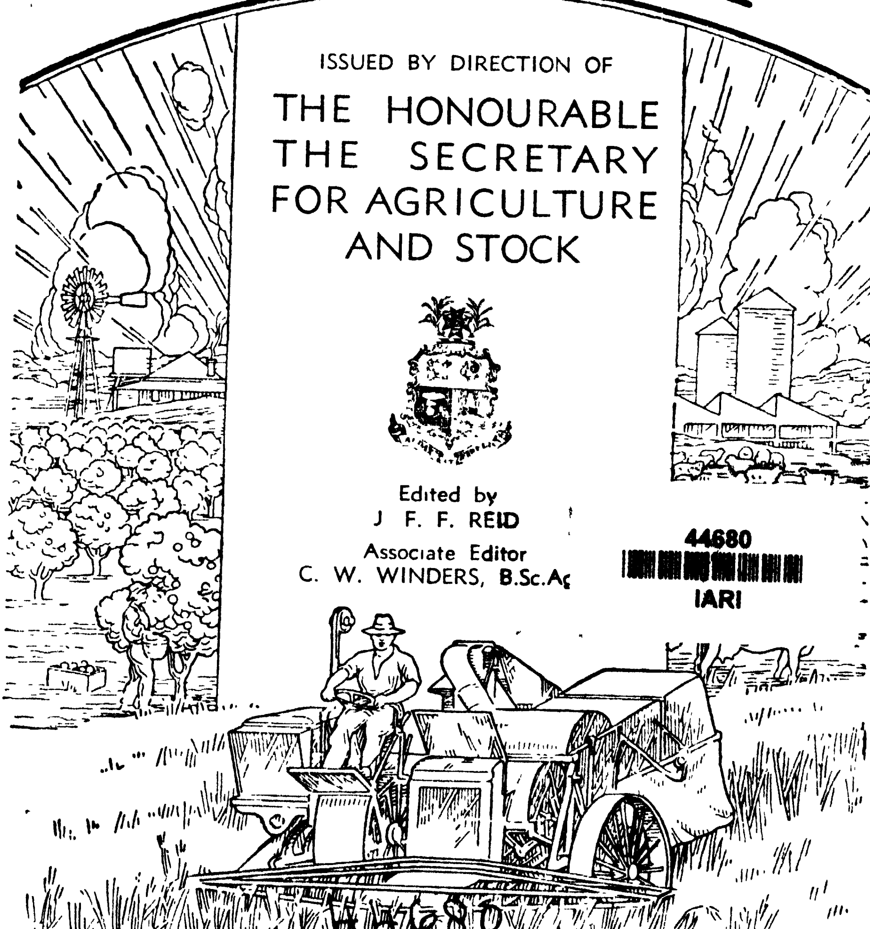
QUEENSLAND AGRICULTURAL JOURNAL

ISSUED BY DIRECTION OF

THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK



Edited by
J. F. F. REID

Associate Editor
C. W. WINDERS, B.Sc.Ag

JANUARY TO JUNE, 1948

Vol. 66 Parts 1 to 6

QUEENSLAND AGRICULTURAL JOURNAL

GENERAL INDEX.

INDEX TO ILLUSTRATIONS

AUTHOR INDEX.

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Volume 66 Part 1

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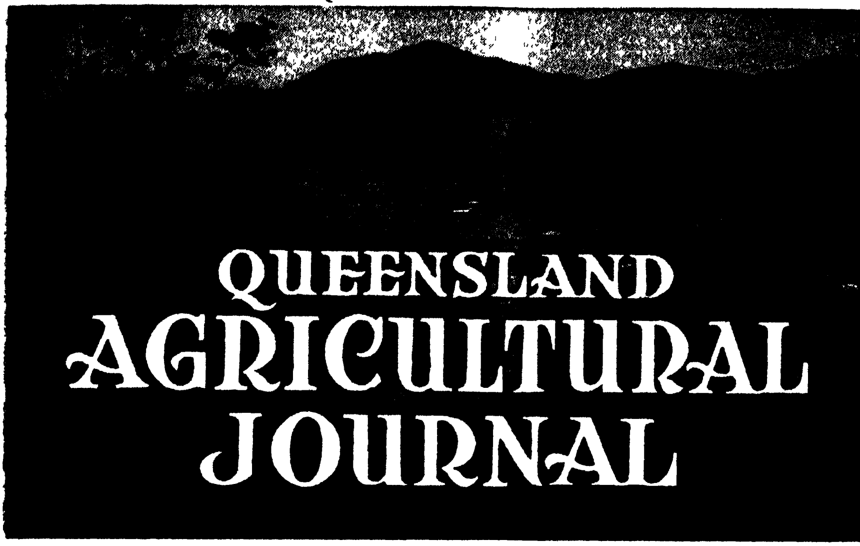
THE HONOURABLE H. H. COLLINS
MINISTER FOR AGRICULTURE AND STOCK

GOVERNMENT PRINTER, BRISBANE

Contents

ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



Volume 66 | 1 JANUARY, 1948 | Part 1

Event and Comment.

The Junior Farmers' Club Movement.

A SYSTEM of rural education which will fulfill the needs of the new agriculture goes far beyond the mere mechanics of farming, affecting every aspect of the life of the farmer. It will give him from early boyhood an unconscious philosophy towards the land and a real regard for that which gives security to himself and his family, stability to his way of life and essential community service.

Hand in hand with better educational facilities in the country must go ways and means of developing improved farming techniques and of ensuring the maintenance of a prosperous, virile, well-informed and enterprising rural population which is so vital to the future security of Australia. Among the ways and means is the Junior Farmers' Club Movement to which every encouragement to its establishment in Queensland should be given. In the southern States this organization, many thousands strong, already exerts an influence for good, an influence spreading and deepening as time goes on, taking a major part in strengthening the economic structure of the land industries and demonstrating that the practice of agriculture along scientific lines is something much more than just another way of making a living.

In other parts of the Commonwealth the Junior Farmers' Club Movement has taken firm root and its extension to this State will, no doubt, be welcome, particularly as a lead to the recognition of agriculture—the science of food production—as worthy of a first place in our national educational curriculum, a place already achieved under the stress of war in our national economy.

THE MINISTER'S NEW YEAR MESSAGE TO THE FARMERS OF QUEENSLAND

THE recent bountiful rains may be accepted as a happy augury for the New Year, presaging, it is hoped, good seasons and heavy harvests at a time when food is among the world's most urgent needs.

The past year was one of expanding activity in the Department of Agriculture and Stock. Several new undertakings of first importance to the land industries were inaugurated. Two new branches were established within the Department to deal with problems of soil conservation and the husbandry of beef and dairy cattle; and a price and crop reporting service was instituted within the Division of Marketing. Further development and extension were recorded in projects for systematic fodder storage, pasture improvements, plant breeding and protection and field trials of crops new to Queensland agriculture.

Hon. H. H. Collins

The Department is an essential part of our rural organization. Its administration is planned and its efforts are directed to the service of farmers, graziers, and others engaged in primary production. Through its technical and advisory staffs the Department keeps in close personal touch with producers on their own holdings, helping them in the solution of their problems with authentic information based on field experiments and trials, experienced advice and practical demonstrations. The degree of success is, however, measured by the degree of co-operation accorded by the producers themselves. It is expected of them that they, in their own interests, should make use of all the services available to them through the highly trained officers of the Department whose life work is the advancement of agriculture and animal husbandry in this State.

In a changing world there is one thing that does not change and that is the land itself. No matter what else happens, the land remains to give us a living, a living in accordance with our efforts to serve the land and our wisdom in using it.

On behalf of the officers of the Department, and personally, I wish the primary producers of Queensland all good in the coming year, health and happiness in their homes and a continuance of the prosperity of which present seasonal conditions are a cheerful portent.

H. H. Collins

Secretary for Agriculture and Stock.

Department of Agriculture and Stock,
Brisbane, 1st January, 1948.

Field Crops

Canary Seed.*

C. S. CLYDESDALE, Senior Adviser in Agriculture, Toowoomba.

THIS grass, which furnishes the canary seed of commerce, is a native of the Mediterranean region. It is fairly widely cultivated in warm temperate countries for seed purposes, and is used in Queensland for grain and grazing. It is an annual tufted grass with very soft leaves and a fairly shallow root system. The stems are erect and bear short, ovoid seedheads with a dense formation of flowers. The seed is light yellow in colour, hard and shining.

Owing to Australia's limited requirements of bird seed generally, canary seed is regarded as a minor crop, but nevertheless it has proved a useful source of revenue to many Downs farmers, particularly during seasons when late rains have prevented a full normal sowing of wheat. In Queensland, the Darling Downs wheat lands provide the bulk of the area sown, Allora, Warwick, Clifton, Pittsworth, Oakey, Brookstead, Cecil Plains, and Dalby being the most important centres, though canary seed is also produced in the South Burnett district. The heavy black Downs soils appear very suitable for the production of this crop, and as standard wheat cultivating and harvesting machinery can be employed no extra outlay is entailed for machinery.

Preparation of the Soil.

As for other winter growing cereals, the land intended for sowing canary seed should receive a thorough preparation when it is intended to grow for grain. A summer fallow is essential in order to conserve much of the summer rainfall, which normally provides most of the moisture requirements of the canary seed crop. The land should be ploughed or sundercut early in the summer to a depth of 3 to 5 inches and allowed to lie in a rough state for a few weeks, so that it will break down well on harrowing. Weeds should be destroyed periodically during the fallowing period by harrowing. This operation will also prevent a hard crust forming and maintain the desired soil mulch.

Sowing.

Sowing may be carried out from March to May and the seed is drilled rather than broadcast, as it not only makes a good strike more certain but also is more economical of seed. Sowing at the rate of 8-10 lb. per acre will produce a good stand if drilled in, but at least 30 lb. are required if broadcast. About 2 inches is a satisfactory depth at which to sow, and with the drill it is a simple matter to ensure that

* *Phalaris canariensis* L.

the seed is sown at this depth, though when broadcast seed is harrowed in the depth of soil covering is likely to vary considerably. Once established, canary seed is a fairly drought resistant crop.

Grazing or Feeding Off.

On the self-mulching types of Downs soils the young plants are easily pulled out by sheep or cattle; grazing consequently should not commence until the plants are firmly rooted. This should be about six or eight weeks after planting or when the plants are about 6 inches tall. The crop can be fed off at intervals until September or October. If it is intended to harvest for grain, the crop should not be grazed later than July. The time to cease grazing is before the seed heads have developed and this can only be ascertained by examining the plants. If grazing should take place after the seed heads have formed, the plant will have to produce further seed heads from the base and the resultant yield of grain will be greatly reduced.

Harvesting.

The crop may be utilized entirely for grazing or it may be cut for hay. However, it is preferable to harvest the seed, as yields of hay secured from this crop are lighter than those obtained from oats or wheat. As buyers demand a first class article, free from broken or shelled seed, great care must be taken during harvesting operations. It may be thought that the inclusion of broken seed amongst sound grain is of little moment, but it is an acknowledged fact that canaries will not accept as food that grain which has been shelled, preferring to shell their own.

Although modern machinery has reduced the cost of harvesting, probably no sample of canary seed harvested by such means equals that which is harvested by the reaper and binder, and afterwards threshed. The maturing of grain and head, which takes place in the stooks, overcomes those difficulties which are associated with the use of modern harvesters which cut, thresh, and bag the grain in one operation. Some growers value the old system so highly that when they are harvesting for seed purposes they cut their crops with the reaper and binder and thresh with the header.

Under normal conditions an average crop of canary seed is from 4 to 6 bags, or 600 to 900 lb., per acre.

Marketing.

At the present time canary seed is sold on the open market and the prices are still controlled. The ceiling prices are £25 per ton for ungraded seed, while graded seed is worth £28 10s. per ton but must not contain more than 2 per cent. inert matter.

STORY OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

PART 3.

(*Continued from page 129, Q.A.J. for August, 1947.*)

J. F. F. REID.

QUEENSLAND PRODUCTS OVERSEAS.

FROM its earliest years, the Department of Agriculture recognized the advantage of sending officers overseas from time to time to investigate problems of particular interest in relation to Queensland agriculture, or to observe new developments and progress in rural industry in other countries.

In accordance with this policy, A. H. Benson, Instructor in Fruit Culture, was sent to the Franco-British Exhibition in 1908 at which the Queensland Court was an outstanding feature of the general Australian display. Included in the exhibits sent by the Department were wool, meats and other pastoral products; dairy produce; and a wide range of agricultural products in both raw and processed forms. In the course of his comprehensive report which is preserved in the departmental records of 1908-9, Mr. Benson contrasted, by inference, the modesty of Australian exhibitors with the magniloquence of those from other Dominions. "Canadians know how to advertise their country," he commented, "and miss no opportunity of doing so. They believe in their country and show the bright side to the world. You never hear a Canadian complaining of their long and trying winter, but are constantly singing the praises of their summer and the wonderfully rapid growth of all crops during that season. In many ways we can take a lesson from the Canadians, both in the manner of exploiting the resources of our State and by showing confidence in our country, as we possess many natural advantages that Canada is without."

In that year, small but representative exhibits of Queensland products were displayed at the principal agricultural shows of England, Scotland and Ireland, including the Royal Agricultural

Queensland Ministers for Agriculture.

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Since 1915.

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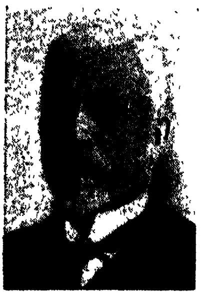
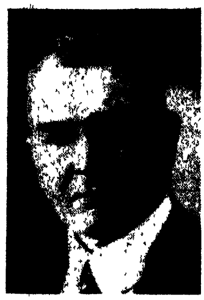
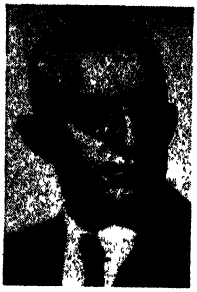


HON. WILLIAM LENNON.
June, 1915-September, 1919.



HON. W. N. GILLIES.
September, 1919-February, 1925.



HON. W. FORGAN SMITH.
February, 1925-May, 1929.

HON. HARRY F. WALKER.
May, 1929-June, 1932.

HON. F. W. BULCOCK.
June, 1932-December, 1942.

HON. T. L. WILLIAMS.
December, 1942-March, 1946.

HON. H. H. COLLINS.
March, 1946-

Plate 1.

Society's Show at Newcastle, the Lincoln County Show, the Highland Agricultural Society's Show at Aberdeen and the Dublin Horse Show. Mr. Benson represented the Department at all these gatherings.

Queensland also was associated with other States in the mission of W. W. Froggatt, entomologist of New South Wales, in the same year to Hawaiian Islands, United States, and West Indies to investigate developments in the control of the fruit-fly pest and to study other entomological problems. His report, included in the annual review of departmental activities, also makes interesting reading in the light of later successes in the control of pests and diseases of plants and animals in this State.

A YEAR OF PROSPERITY.

1908 was a year of agricultural and pastoral prosperity in Queensland, except in parts of the South-western and Darling Downs districts, where long, dry periods had prevailed. Timely rains saved the wheat harvest which exceeded anticipations, in respect of both yield and quality.

Values for primary products were high throughout the year, largely because of adverse seasonal conditions in the southern States, where there was a consequent strong demand for Queensland's exportable surplus.

Fodder Conservation.

The perennial question of systematic fodder conservation was discussed in the annual report of the Department. "This subject," said the Under Secretary (Mr. Scriven), "has been repeatedly brought up in successive reports, and though ensilage and other methods of provision are slowly taking hold on the farming community, it is to be regretted that the practice has not yet become general. An object lesson was recently given at the Rockhampton Show, where the State Farm, Gindie, exhibited excellent bush hay, cured in 1902, that was still nutritious and sweet."

The Banana Industry.

Much attention was given to the development of the banana industry in that year. Its annual value was then well over £100,000. The renovation of exhausted banana lands was planned and experiment areas in the Geraldton (afterwards renamed Innisfail) and Buderim districts were selected with the object of proving the profitability of manuring existing plantations as against "the wasteful practice . . . . of abandoning an exhausted area and clearing new land." The main banana districts were then the Blackall Range, from which Brisbane and Sydney markets were supplied, and Geraldton (Innisfail) and Cairns, which fed the Melbourne and Adelaide markets. Competition with Fiji for the Southern demand had caused considerable concern, added to by the decline in production in the far North, which was ascribed to number of causes, "one of which was the extensive clearing of fresh lands when the trade was very good, the cost of which was not recouped when later, because of the glut in the market, prices fell considerably." The last devastating cylone (that of 1906) and the "Southern restrictions" were important factors "in reducing the energy of growers," but in reality "the biggest danger to the trade," it was reported, was "the practice in the North of obtaining suckers for replanting from whatever stocks are available

. . . . instead of planting the best only, a pernicious practice when the reputation of the trade is in jeopardy. It is from this cause that the complaints have arisen in the South regarding the quality of the fruit offered for sale." Another factor was the change over by Chinese growers from banana planting to cane cultivation in some sugar-mill areas. In after years, as shall be recorded later, banana growing expanded substantially, and in one year the annual value of the industry to Queensland attained a total of approximately £1,200,000.

Cotton.

Cotton was again coming into consideration as, potentially, one of Queensland's most important crops. In 1890, at a farmers' conference at Beenleigh, Professor Shelton, speaking of the possibilities of cotton in Queensland agriculture, said: "It is one of the new industries we cannot make too much of." In the annual report of 1908-9 that opinion was quoted and endorsed with this addendum: "There is in Australia a sufficient market for all the cotton that Queensland can grow for some years to come, and the institution of a bonus given by the Commonwealth will be another incentive towards an extension."

The quality of the samples of Queensland cotton displayed at the Franco-British Exhibition was highly commended by men of wide experience and expert knowledge. Many years were to pass, however, before cotton became listed regularly in our cropping programme. Average returns in the season amounted to £8 an acre, with £11 to £17 for individual yields.

Dr. David Thomatis, a planter of Cairns, evolved, by hybridization, three distinct varieties which, it was reported, possessed "all the best attributes of the best Sea Island variety with other qualities which make them superior to any yet produced in this State." To these cottons the name of Caravonica was given, and "the high prices . . . . they realized in the European markets" were "evidence of their excellence." Cotton growing was gradually extending, "notwithstanding the difficulty of re-establishing an industry which has twice been allowed to lapse."

Sugar.

The cane crop total in 1908 was 1,433,315 tons, of which 88·62 per cent. was produced by white labour. The number of employees in the industry was 4,345; value of machinery, £1,839,902; and the value of land under crop was given as £347,873. The output of sugar in both Queensland and New South Wales was approximately 27,000 tons short of Australian requirements; consequently, fear was expressed that importations from coloured-labour countries might affect the future of the sugar industry in Australia. The "allurements of the dairying industry" was suggested as a reason for a decline in cane production on the Northern Rivers of New South Wales.

Molasses, as a sugar-mill by-product, was in the news at that period, and among various proposals for its economic use was one for the treatment of cancer in cattle. As a stock food, molasses was gaining favour, and it was reported that "as the quantity of waste each year is enormous, the value of it, when mixed with other foods, should be more widely known." An offer from America to purchase "practically the whole of the output at 4 to 5 cents a gallon" was communicated to the sugar mills, but no response is recorded.

Wheat.

Queensland-bred wheats were attracting attention on the score of quality and bushel weights. "In the matter of quality, perhaps no better illustration could be given that the abnormal bushel weights of wheats entered for competition at the various country shows, where many samples tested on standard measures exceed 67 bushels," it was stated in official files. Average yields of over 20 bushels to the acre were harvested that season in some localities on the Darling Downs. One variety sown at the Roma State Farm yielded 37 bushels to the acre. These satisfactory results were attributed to improved methods of cultivation, including frequent tillage.

To foster cereal growing, the Department instituted a system of free distribution of single bushels of graded seed wheat for field trials to interested farmers. The best result of this farm plot work was a yield of 75 bushels of grain from one bushel of seed sown, which was obtained by A. N. Griffin, of Roma. "There is reason for the fulfilment of the hope that the more progressive section of wheatgrowers are becoming alive to the advantages of adopting more systematic cultural methods" was the official comment, to which there was this frank addition: "It is regrettable to observe that whilst many in the drier districts are unsuccessful in obtaining payable returns, an explanation . . . . is in most instances traceable to slip-shod methods in the treatment of the soil."

Dairy Production.

In 1908, Queensland was still in third place as a butter-producing State with an output of nearly 24,000,000 lb., but held the lead in the production of condensed and concentrated milk.

THE TICK PEST.

Some interesting facts emerge from the spirited reply by the Department in its annual report to Southern criticism and to charges of inactivity in respect of the cattle-tick pest which had spread to New South Wales.

The tick was first observed as a pest in 1894 in unfenced cattle country of North-west Queensland. Apparently the first recorded occurrence of the redwater disease in cattle, transmitted by the cattle tick, was in a mob belonging to Dr. Brown and travelling from the Roper River in the Northern Territory, by way of Queensland, to Newcastle Waters in the winter of 1886. The nature of the pest was then quite unknown, and experience of it had to be gained before the checking of its advance could be attempted. "If the tick had reached Queensland like the rabbits by way of New South Wales and through settled districts," stated the Under Secretary, "there would be a better chance of checking it than was possible by reason of its progress through unsettled districts in a region where climatic conditions were favourable to it. Much money has been spent in experiments, in constructing dips, in ascertaining the best mixtures for destroying the tick, and in finding out the best treatment for the fever resulting from infestation."

Dr. Hunt and W. Collins were sent to America to inquire into cattle-tick infestation there. The Stock Institute was established to investigate animal diseases, including tick fever and redwater, under

the direction of C. J. Pound. Inspectors were appointed to control the movements of stock. Experiments in inoculation were conducted and other methods of tick control were adopted. In addition to Government dips, 1,050 private dips were constructed and many more, no doubt, were unrecorded. Analyses of dip mixtures also were undertaken. Local authorities were subsidized to provide public dips in their areas. Subsequently, inoculation against tick-caused ailments under the supervision of the Department was arranged; in the year 1907-8 no fewer than 34,000 cattle were so treated.

To further facilitate research into tick and other animal diseases, a completely equipped stock experiment station was established by the Department at Yeerongpilly under the direction of S. Dodd, F.R.C.V.S., who had had a long experience of stock disease control in South Africa and whose appointment was recommended by the Royal Veterinary College.

QUEENSLAND'S 50TH ANNIVERSARY.

In 1909 occurred the 50th anniversary of the foundation of Queensland as a colony. The Parliamentary Papers of that year contain a review, incorporated in the report of the Department, of rural progress since 1859. The estimated population of Queensland in 1859 was 25,020 people of European origin, most of whom, the departmental recorder assumed, had no direct association with country life and industry.

The total area under cultivation was then 3,353 acres; imports were valued at £742,023, and exports at £523,476—mostly agricultural and pastoral products, chiefly wool. In the year of separation from New South Wales, livestock statistics included: Horses, 23,504; cattle, 432,890; sheep, 3,449,350; pigs, 7,147.

The average yearly wages for rural workers were: Farm labourers £45; shepherds, £40; women farm workers, £25 and keep. As illustrative of the official outlook of the time, the report of the Registrar-General (Darvall) for 1860 is of particular interest. An extract: "As yet, agriculture has made little progress; the high rate of wages [sic], uncertainty of getting labour when required, and the difficulty of conveying produce to market—over roads always bad, and often impassable—have hitherto made it more economical to import almost all kinds of agricultural produce than to grow them. Sufficient has, however, been done to show that while the higher tablelands of the interior are well adapted to the growth of cereals and other vegetable production of the temperate zones, the lowlands lying near the sea, and along the banks of Eastern Rivers, are capable of producing the most valuable productions and luscious fruits of the torrid zone—viz., cotton, sugar, coffee, arrowroot, the pineapple, bananas, mango, &c., &c."

In its 50th year, 1909, Queensland had a population of 558,237; the area under cultivation was 650,472 acres; and livestock numbers included: Horses, 519,969; cattle, 4,321,000; sheep, 18,348,851; and pigs, 124,759. Agricultural exports represented 19·02 per cent. and pastoral exports 50·28 per cent. of the whole export trade of the State.

[TO BE CONTINUED.]

Management of the Orchard Soils of the Stanthorpe District.

A. A. ROSS, Horticulturist.

THE orchard soils of the Stanthorpe district are all of granitic origin. The area of alluvial soil in the district is very small and it is used almost exclusively for vegetable growing. Like all soils derived from granite, that typical of the Stanthorpe district is of sandy texture and in many places is found to be relatively coarse. In its uncleared state it supports an open forest formation, which provides only a meagre supply of organic matter, with the result that even newly cleared land is relatively deficient in humus. The unimproved soils are often poorly supplied with several of the common plant foods. A shortage of nitrogen is indicated by the marked response frequently obtained from applications of nitrogenous fertilizers, especially with stone fruit trees. In addition, a deficiency of the trace elements, zinc, boron, and copper, has been found in many parts of the district.

The soil management practices commonly adopted in the past have followed a system of frequent and usually deep cultivation which has the effect of reducing very rapidly the already low organic matter content. The store of mineral nutrients has been depleted by excessive leaching and erosion. As a result, many orchards in the district are gradually declining and some have been abandoned. It is obvious, therefore, that, in order to arrest this decline and to maintain the full productive capacity of the soil, a system of management must be followed which not only conserves to the utmost the organic matter and the plant nutrients already in the soil but also supplements the supply of those constituents which are present in inadequate quantities.

THE PART PLAYED BY ORGANIC MATTER IN THE SOIL.

In order to appreciate the full importance of organic matter in the soil, it is necessary to have some understanding of the role it plays in plant nutrition and in soil-forming processes. Organic matter is one of the fundamental soil constituents which govern plant growth, as it directly and indirectly influences the biological, physical, and chemical conditions of the soil.

When organic matter is added to the soil, it is acted upon by several types of micro-organisms and decomposed into a variety of products, the commonest of which is known as humus. If there is an

abundance of humus in a soil the soil organisms are kept at a high level. The activity of these organisms greatly influences the availability of certain plant foods which otherwise may be held in the soil in a "fixed" form, that is, in a form unavailable to the plant.

The chemical composition of the soil is directly affected in that much of the organic matter consists of plant food materials which, as decomposition proceeds, are released in a form in which they can be freely utilized by the growing plant.

In so far as the physical condition of the soil is concerned, organic matter influences three factors, viz., soil colloids, soil structure, and soil moisture.

Soil Colloids.

The colloidal material present in a soil is very closely associated with plant nutrition because it is from its surfaces that nutrients are absorbed by the roots of plants. The colloidal complex of the soil is composed of extremely minute mineral particles, or clay, and equally minute organic particles represented by humus. The proportion of clay in a soil is an inherent property and it cannot be altered by any practical farming methods. The organic fraction of the colloidal complex, on the other hand, can be changed. Under normal farming practice it is diminished by operations such as cultivation and burning of stubble and increased by the addition of organic matter.

Soil Structure.

In the absence of organic matter, a soil is inclined to develop a "single-grained" structure wherein each soil particle exists as a separate individual. This condition is most undesirable. It prevents adequate aeration and, because the surface pores become clogged easily during rainy periods or when water is applied by irrigation, reduces the rate of penetration of water through the soil surface. Aeration can be retarded to such an extent as to influence adversely the growth of the plant by restricting the exchange of gases between the roots and the soil air. This is experienced in the case of waterlogging. For the normal activity of micro-organisms in the soil, a supply of oxygen is required and this may be partly withheld in a soil of poor structure with inadequate aeration.

On the other hand, when there is an abundance of organic matter present in the soil, the formation of a desirable "crumb" structure is encouraged whereby the soil particles become cemented together into aggregates which are relatively stable. Such a condition greatly improves the porosity of the soil, which in turn assists aeration. By resisting the beating action of rain, a crumb structure also tends to keep open the surface pores. This allows the free entry of a greater volume of water and delays the formation of surface puddles which are the starting points of soil erosion.

Soil Moisture.

If a relatively impermeable crust is allowed to develop on the surface of the soil, as so readily happens when the organic matter supply is low, the proportion of rain water which runs off, instead of penetrating the soil, is relatively high, thus considerably reducing the amount of moisture which will become available for the use of the

orchard trees. Under the non-irrigated farming methods adopted in Stanthorpe orchards, every season there is liable to occur a period of moisture deficiency in the soil. Records indicate that this happens fairly regularly during early January, and in poorly managed orchards is reflected in the slow increase in size of Jonathan apples. If this is to be avoided the absorptive capacity of the surface soil must be increased to a maximum. Organic matter in all stages of decomposition has a relatively high affinity for water. If present in a soil in sufficient quantities, therefore, it will have the effect of increasing not only the water-absorbing capacity but also the water-retaining properties of that soil.

Plate 2.

A GOOD CROP OF NEW ZEALAND BLUE LUPINS, WHICH YIELDED 30 TONS PER ACRE (GREEN WEIGHT).

METHODS OF SUPPYLING ORGANIC MATTER TO THE SOIL.

Although very commonly the case, it can only be considered a poor policy to allow a soil to deteriorate to the stage where nutrient deficiency symptoms appear in the plants grown before adopting some system of soil improvement. The appearance of such symptoms in fruit trees occurs only after the deficiency has been experienced for some time. Therefore, in many cases, recovery may be expected to be delayed for a considerable period following the adoption of remedial measures. A policy of prevention should be favoured in order that the plant should not receive a nutritional setback at any stage of its life. Special attention should be given to ensuring that proper soil management practices are adopted from the time land is first cleared so that there is a steady improvement in fertility instead of a gradual decline.

Possibly the commonest method of supplying organic matter to the soils in older countries is the application of farmyard manure. Under Queensland conditions, farmyard manure is not available in large quantities, partly because here animals are not housed during the winter and partly because much of the tractive power used on farms is now mechanical. Other organic by-products, such as sheep manure, sawdust, and straw, are not available in the Stanthorpe district and, as transport of sufficient quantity to constitute an effective dressing would not be economic their use cannot be advocated. The growing of green manure crops is, however, quite a practical and economic proposition. In the majority of seasons, if proper cultural methods are adopted, very satisfactory crops can be produced. Preference must be given to those crops which have the capacity to produce a large quantity of green material when grown during the winter months. Moreover, since the soils of the district are fairly uniformly deficient in nitrogen, a leguminous crop, which will transfer atmospheric nitrogen to the soil, should be selected wherever possible.

Plate 3.

A CROP OF RYE WHICH YIELDED 7 TONS PER ACRE (GREEN WEIGHT).

APPLICATION OF ARTIFICIAL FERTILIZERS.

The question of how to fertilize deciduous fruit trees is one which cannot be completely answered. In the Stanthorpe district, experiments have not been able to show that any of the fertilizer ingredients produce very marked effects on the growth or yield of apple trees. However, very definite responses have been obtained from the application of nitrogenous fertilizers to stone fruit trees, while soil dressings of the trace elements, boron and copper, have been effective in overcoming

certain deficiency symptoms*. Further experiments may show that fertilizers have some influence on keeping quality of fruit, as has been demonstrated elsewhere. But, for the present, it would appear an unwise practice to apply large quantities of artificial fertilizers to deciduous fruit trees, with the exception of stone fruits.

Green manure crops have been shown to respond very definitely to the use of artificial fertilizers in Stanthorpe soils. Therefore, in the present state of knowledge, the safest course to adopt in fertilizing an orchard is to aim at producing the greatest possible amount of green manure from each planting by fertilizing the green crop. As a result of experiments conducted along these lines, it has been found that leguminous crops do best when grown on a fertilizer mixture containing moderate amounts of nitrogen, relatively high proportions of phosphate and small quantities of potash.

Plate 4.

A DESIRABLE CONDITION OF THE SURFACE SOIL FOLLOWING TURNING IN OF GREEN MANURE CROP.

A mixture of approximately 4:15:2 formula would be considered suitable. The quantity to be applied per acre will vary according to the fertility of the soil at the time of planting, but, on an average, a dressing of 2½ cwt. per acre will suffice. Cereal crops, on the other hand, respond only to nitrogen in these soils and therefore phosphates and potash can be safely left out of the fertilizers used for growing them. A satisfactory rate of application is sulphate of ammonia 1½ cwt. per acre, or nitrate of soda 1¾ cwt. per acre.

* The treatment of trace element deficiency disorders in deciduous fruit trees is described in 'Departmental pamphlet No. 103, which can be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, or from the Stanthorpe Field Station.

METHODS OF CULTIVATION.

The system of clean cultivation commonly adopted in the past has resulted in rapid depreciation of much of the soil of the district and a somewhat revolutionary programme of permanent soil conservation needs to be introduced now to maintain economic farming in the future. Such a programme must commence with proper methods of cultivation. It must always be remembered that constant tillage is the most rapid means of depleting the supply of humus in the soil, especially during the summer. Depletion of the humus is quickly followed by the destruction of the crumb structure of the soil and this, in turn, induces soil erosion. The question of whether cultivation conserves moisture is no longer held in doubt. It has been proved by numerous investigations that moisture is conserved by cultivation only by the control of weeds

Plate 5.

TURNING IN A 30-TON CROP OF NEW ZEALAND BLUE LUPINS WITH TANDEM DISC HARROWS.

and that the stirring of an already clean surface achieves nothing in the way of saving moisture. At present, throughout the world there is a tendency towards shallow cultivation just sufficient to keep weeds in control, and to break any surface crust which may form, so that, when rain falls, penetration will be increased and run-off reduced.

The method of cultivation which has the best prospects of success in orchards is trashy cultivation or stubble mulching. In this system, winter green manure crops, weeds, &c., are not turned completely over and buried as is done in the operation of ploughing but are merely chopped up and incorporated with the top few inches of soil. It will be noticed that under natural conditions, e.g., on the forest floor, the litter or organic matter is on the surface of the soil.

It follows from this observation that, in the process of soil building, improvement should proceed from the top as it can be safely left to

the leaching action of rain to carry the products of decomposition downwards through the soil. A layer of trash-soil mixture increases the absorptive capacity of the soil surface and at the same time checks the flow of water during heavy falls of rain. Thus, on even moderate slopes it can have a considerable controlling influence on soil erosion. In addition, it tends to reduce the temperature of the surface soil and this, during dry periods, has the effect of minimizing the loss of moisture from the soil by evaporation.

This system of cultivation really calls for the introduction of some new types of implements. Many such machines have been experimented with in overseas countries and it may be expected that, in the near future, these will be available in Queensland. However, certain of the implements which are already in common use will provide a good substitute, if handled correctly. Tandem disc harrows and rotary hoes, adjusted to shallow working, say 2-3 inches, make an excellent job of turning in green manure crops, but the operator must be taught that the ideal finish is one where the surface is left rough, with a certain amount of the plant material still uncovered. Complete burial is the condition which must be avoided.

SUMMARY.

The organic matter content of the majority of the soils of the Stanthorpe district is low and this is the material which must receive first attention in any soil building programme.

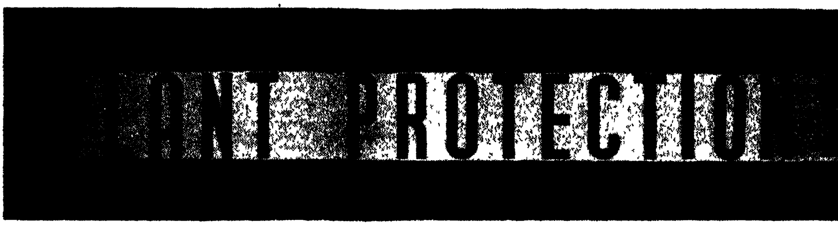
Soil organic matter has the effect of improving the structure of the soil, of liberating plant food materials which are present in the soil in an unavailable form, of increasing the effectiveness of artificial fertilizers, of assisting aeration of the soils, of providing better conditions for microbial activity, and of protecting reserves of plant nutrients from loss by erosion.

The growing of green manure crops is the most practical method of increasing the organic matter content of the orchard soils of the Stanthorpe district.

The most economical and effective method of fertilizing these orchard soils is to apply fertilizer to the green manure crop with the object of obtaining the maximum yield. The plant food ingredients of the fertilizer are not lost to the trees by this practice but ultimately may even be rendered more readily available. In addition, with leguminous crops, nitrogen will be accumulated. A satisfactory dressing for leguminous green manure crops is 2½ cwt. per acre of a mixture of approximately 4:15:2 formula, and for cereals 1½ cwt. per acre of sulphate of ammonia or its equivalent nitrogen content in some other form.

Frequent cultivation of these soils does not conserve moisture beyond retaining that which otherwise would be consumed by weeds. On the other hand, it hastens the depletion of humus and has a bad effect on soil structure.

Shallow, trashy cultivation is preferred to deep working and to the maintenance of a perfectly clean surface, as it reduces the tendency of a soil to erode, improves the structure of the surface soil, increases the absorption of water during falls of rain and reduces evaporation of moisture from the soil.



Control of Field Crop Diseases.

R. B. MORWOOD, Pathologist, Science Branch.

TO the fruit and vegetable grower the control of plant disease usually means the use of a spray or a dust containing a fungicide. With a few exceptions such methods are too expensive to be applied to crops grown on a large scale. On the farm other precautions are taken to minimise losses from disease. Cultural methods which produce a vigorous crop are of some assistance and the use of resistant varieties, when available, is an obvious advantage. These notes deal with three more direct disease control measures applicable to crops grown on a large scale but not of as high a value per acre as fruit and vegetables.

SEED TREATMENT.

Winter Cereals.

The most widely used direct disease control measure in field crops is seed treatment. This has been practised for a long time in the case of cereal smuts. In one of the earliest treatments wheat was dipped in strong salt solution. This was later replaced by weak solutions of bluestone, and now most cereals are treated with a fungicidal dust before planting. It is interesting to note that an Australian, Dr. Darnell Smith, was the first plant pathologist to introduce the use of dry treatment for cereals against smut. He found that copper carbonate at the rate of 2 oz. per bushel was quite effective for this purpose. Copper carbonate is still used, though the organic mercury dusts are also available for the same purpose.

Organic mercury dusts have the advantage of not interfering with the run of the seed through the drill; also, they are slightly volatile and their effectiveness increases if the seed is stored for a day after treatment. This is a considerable advantage in the case of seeds which are covered with a permanent husk. Such seeds as barley and oats are not effectively protected from smut by copper carbonate, as this does not reach the spores protected by the husk. Prior to the use of organic mercurials, the volatile liquid fungicide formalin had to be used to kill the spores. It is now found that the organic mercury dusts achieve this purpose.

The most recent development in seed treatment is the use of non-metallic dusts—that is, organic fungicides containing neither copper nor mercury. Of these, Spergon and Tetroc are most widely used, mostly on peas and beans. They have shown no advantages so far as cereals are concerned.

Methods of application of dusts on cereals have undergone considerable modification since they were first used. The use of devices such as the barrel mixer has given place to running the dust in during continuous grading operations. Where farmers own a grader, either individually or co-operatively, and grow their own seed, there is no difficulty in the application of the seed treatment. Similarly, contractors will treat farmers' own seed efficiently when grading it. When farmers purchase graded seed there is a regrettable tendency to neglect seed treatment as there is no need to grade this seed again, excepting to apply a fungicide. The risk of heavy loss from ball smut, however, makes careful farmers even more anxious to treat purchased seed.

Summer Grain Crops.

The winter cereals are not the only ones of which it is desirable to treat the seed. Some varieties of sorghum are affected by smut, hence seed treatment is indicated. It is interesting to note that both sorghums and maize are treated in the U.S.A., largely to improve germination and seedling growth. Conditions differ somewhat in most of the American farming districts in that rainfall is higher, winters are colder, and summer seasons shorter. Summer crops therefore tend to be planted in cold damp soil. Under these circumstances there seems to be little doubt that treatment with organic mercury dust considerably improves the stand and consequently the yield of both sorghums and maize. Careful trials were carried out in Queensland at Lawes, using healthy maize seed, to test the effect of seed treatment on emergence and yield. After a considerable number of years of trial, it was concluded that no advantage was gained under our conditions. It is of no use treating the seed in an attempt to control the worst of our maize diseases, namely cob rot.

Peanuts.

Germination and stand of peanuts have been shown to be very much improved by seed treatment with organic mercury dusts. This has been practised for the last ten years in Queensland. Prior to this period the best variety of peanuts, Virginia Bunch, usually occurred in very poor stands owing to the rotting of seedlings just below the ground or at ground level. This trouble, known as crown rot, is believed to be caused by any one of a number of weakly parasitic fungi which enter the kernel through small injuries. Organic mercury dusts have been found to be effective, if not in completely controlling crown rot, then in allowing a reasonable stand to be obtained.

SEED CERTIFICATION.

Many plant diseases are distributed on planting material, hence it is highly desirable to obtain seeds, tubers, cuttings, or whatever is used for propagation, in a state as free from disease as possible. The state of freedom of seeds, &c., can best be determined by examination of the crop in which they were grown. Examination of the seed, however useful it may be to determine its powers of germination and freedom from weeds, is not a good measure of its freedom from disease. This is particularly so in the case of potato virus diseases. Seed tubers may appear quite sound and still be heavily infected with virus. Consequently the only way to obtain good supplies of seed tubers is to get them from a crop known to be healthy. As a result there have arisen seed certification schemes for potatoes.

These involve the examination of the crop several times during its growing period, the rogueing of infected plants, if there are not many, and inspection and careful labelling of the bagged tubers. If more than a certain small percentage of diseased plants are present the crop is rejected.

In Queensland we are dependent on the southern States for annually replenishing our seed potato stocks. Fortunately good seed certification schemes are well established in some of these States and we are able to obtain seed which has reduced considerably the losses from virus disease. This does not entirely apply to losses from other diseases, such as scab, which are both seed- and soil-borne. Seed treatment is available to minimise the amount of scab in a crop and consequently in the seed certification schemes inspectors are not so severe on the presence of a small amount of this disease. There is no seed treatment available for elimination of virus diseases from potato tubers.

Seed certification is being extended from potatoes to other crops, for example grain sorghum, and is a highly desirable development for the future. It should be noted that elimination of diseases is not the only advantage of seed certification. It is an admirable opportunity for insisting on varietal purity and for the development of high yielding strains.

CROP ROTATION.

The disease control aspects of crop rotation are probably of secondary importance to its generally beneficial agronomic effect. However, the reduction of disease following this practice is by no means unimportant.

Maize.

The most serious maize disease is cob rot. It accumulates in maize debris in the ground and is carried over from one season to the next in this debris; hence it is obvious that crop rotation should play an important part in the reduction of this disease. It is not so widely known that crop rotation is also desirable for the reduction of maize smut, which lives over in the soil.

An interesting sidelight on the influence of machinery on diseases occurs in the case of cob rot. Harvesting machinery to obviate the traditional hand pulling and threshing of corn is rather bulky and extensive. Consequently farmers who have obtained this harvesting machinery at considerable capital outlay attempt to justify it by planting larger areas of maize. As a result, a bigger proportion of the farm is planted to this crop and it is much more difficult to practice crop rotation. Under these circumstances cob rot appears to be on the increase where such machinery is being introduced. It is not only the debris in the immediate paddock which affects cob rot incidence; the remains of a maize crop blown from adjacent paddocks also has a big influence on the amount of disease.

Wheat.

On the Darling Downs wheat is usually grown more or less continuously. Quite good crops have been produced year after year on some of the best Downs soils. The limiting factor to this practice in Queensland appears to be weed growth rather than soil exhaustion or accumulation of diseases. This is in contrast to other wheat-growing areas, where take-all and root rots soon accumulate if wheat is grown too frequently on the same land.

In one area on the Downs root rot appears to have been increasing during the last few years. It can be kept in control by good rotational practices. However, as wheat is the most suitable crop for the area, further investigations are being made to see if a deficiency accounts for this more or less isolated occurrence.

Peanuts.

It has already been stated that seed treatment for obviating crown rot of peanuts is effective but does not give complete control. For germination of peanuts, as with other seeds, it is highly desirable that there should be plenty of humus in the soil. The amount of humus also appears to have a direct effect on the amount of crown rot occurring. Cropping to peanuts is a very serious factor in the removal of humus from the soil. When harvested, the whole of the plant, including most of the root, is carried away from the place in which it was grown, very little being returned to the soil. This results in a very much depleted soil. Rotation to maize or other annual crops is quite beneficial but, to get the best results, it has been found that a few years under grass is necessary. It is interesting to note that, in the control of crown rot, the accumulation of humus in the soil is more important than the elimination of diseased peanut material.

A typical instance which supports that contention very strongly will be described. In badly overcropped peanut land a rain only just sufficient to germinate the seed was received. The paddock was planted, with very poor results. An adjoining paddock, in which crops had been rotated and in which remains of maize stalks were to be seen, germinated well with very little crown rot. In the bad paddock the only place where the peanuts germinated well was the site of the old peanut stack. In this area there would have been very much more infective material of the crown rot fungi but, owing to the presence of abundant humus, the kernels germinated well. Where there was little humus, and presumably lesser quantities of infective material, there was practically no survival of seedlings.

This is, of course, an instance of infection by weak parasites, when the seed has germinated under adverse conditions. Not all parasitic fungi behave in this manner. Irish blight of potatoes and rust of wheat are examples of diseases caused by parasites which appear to have a preference for the most vigorous plants.

APPROVED STRAWBERRY RUNNERS.

The following strawberry growers have satisfied the requirements of the approved strawberry-runner scheme of the Department of Agriculture and Stock. This scheme was initiated in 1947 with a view to arresting the spread of strawberry virus diseases and to improve the quality of strawberry-planting material generally. The growers listed may therefore sell their runners as "approved by the Department of Agriculture and Stock":—

Mr. C. A. Kempnich, Pinklands, via Cleveland.
Mr. R. W. Mitchell, Pinklands, via Cleveland.
Mr. E. W. Rogers, North Coast road, Redcliffe.
Mr. F. Rasmussen, Maroochydore road, Woombye.
Mr. T. Sproul, Maroochydore road, Woombye.
Mr. H. T. C. Gibson, Buderim.
Mr. T. E. Kidd, Buderim.
Mr. W. A. Wood, Image Flat road, Nambour.

THE Pig Farm

Pig Farm Accommodation.

F. BOSTOCK, Officer-in-Charge, Pig Branch.

THERE is no farm animal which is so quickly matured and has so improved with the aid of scientific research as the pig and every effort is being made to produce a carcass that will conform to the requirements of the consuming public.

However, there is but one final objective in the raising and marketing of pigs: that objective is to make money by the conversion of a variety of foodstuffs, per medium of the pig's digestive system, into edible pork.

Fortunately the pig is readily able to adapt itself to almost any class of foodstuff, but for best results the food should be of a mixed nature and well balanced in food elements. It must be fed, in sufficient quantities, from sanitary utensils and troughs placed on impervious feeding floors and kept continuously clean.

In providing the necessary accommodation for pigs the farmer must consider the health and comfort of the stock and plan so as far as possible to prevent disease. At the same time he should bear in mind the system of feeding and management it is proposed to adopt.

Climatic influences will play an important part in the class of materials most suitable for any particular district. It is to be expected, for instance, that in a humid and generally damp district decay in certain classes of timber will occur more readily than in drier districts. It is advisable, therefore, for farmers to select materials which will give the maximum service and avoid the necessity of replacements for many years.

In wet districts, muddy yards are often a disturbing, contaminating factor and similarly in dry districts, dry yards. Both have an adverse influence on the health of the stock. In the construction of pens and yards, &c., the farmer should give consideration to safeguards against mud and dust, as well as to drainage of the land and direction of prevailing winds, and set the buildings in such a manner that the stock will be afforded maximum protection.

With a view to assisting and guiding pig farmers in the lay-out of the piggery buildings to the best advantage, plans have been prepared. However, it is not possible for one set plan to suit all cases, but it is possible to indicate the essential items. Also, the industry is controlled by legislation under the Pig Industry Act, Dairy Produce Act, Diseases

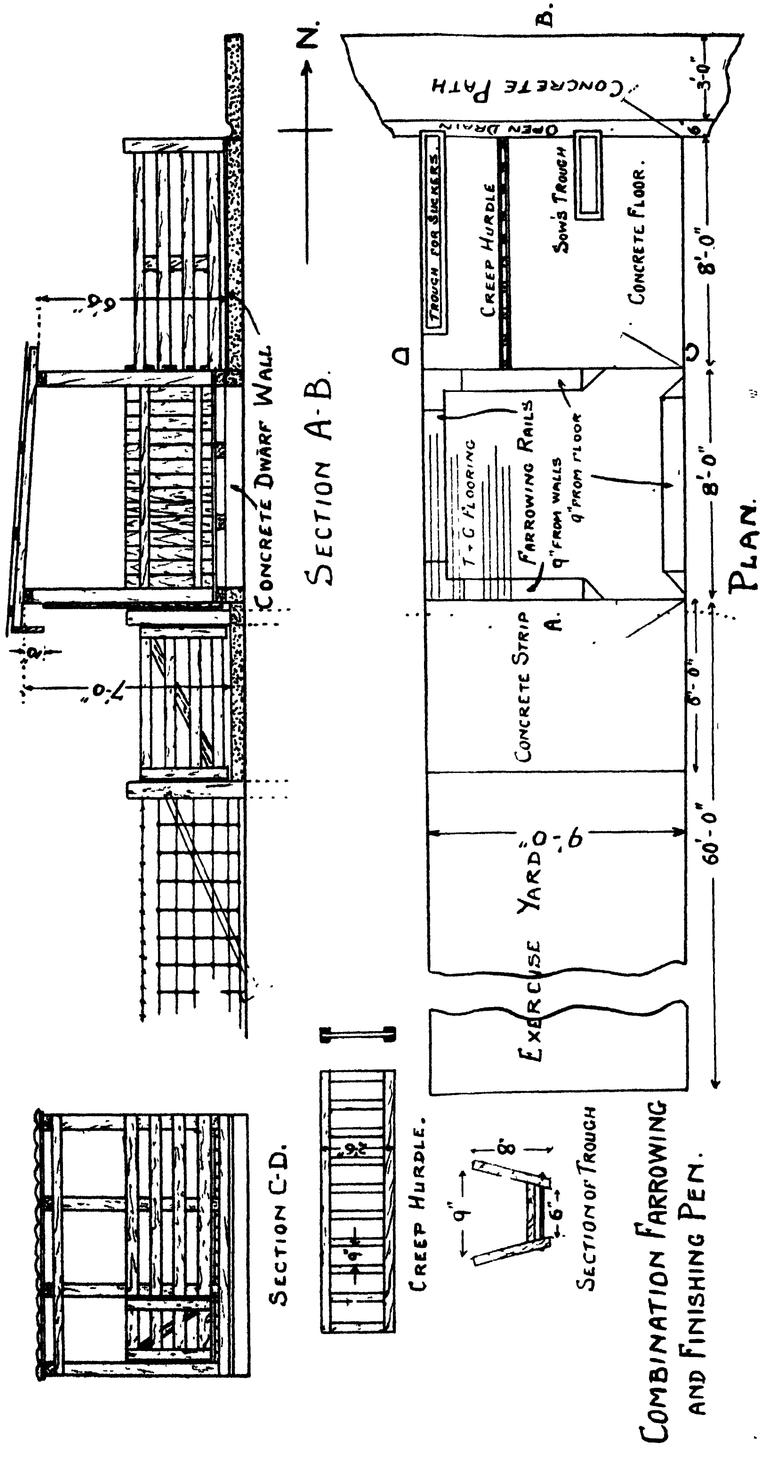


Plate 6.

LAY-OUT OF FARROWING AND FINISHING PENS.

in Stock Act, Slaughtering Act, and the by-laws of city, municipal and shire councils. Therefore, it is recommended, when about to construct or alter a piggery, to consult the authorities concerned, remembering that the general purpose of the legislation is to provide for health and sanitation on the premises where pigs are kept and is not aimed at hindering progress or increasing costs of production.

The most important feature of pig accommodation is sanitation, and bearing this in mind, there are only two systems of keeping pigs which can be expected to give satisfaction—the grazing or open air system, under which pigs are kept on fresh pasture, which is either rested or cultivated and grazed in rotation, and the intensive or indoor system, when pigs are kept on impervious floors which should be properly drained and regularly cleaned. In both systems cleanliness is of first importance, because many of the infections to which pigs are subject may be found on the ground or floor of pig pens which have not been "spelled" or are inconvenient to clean.

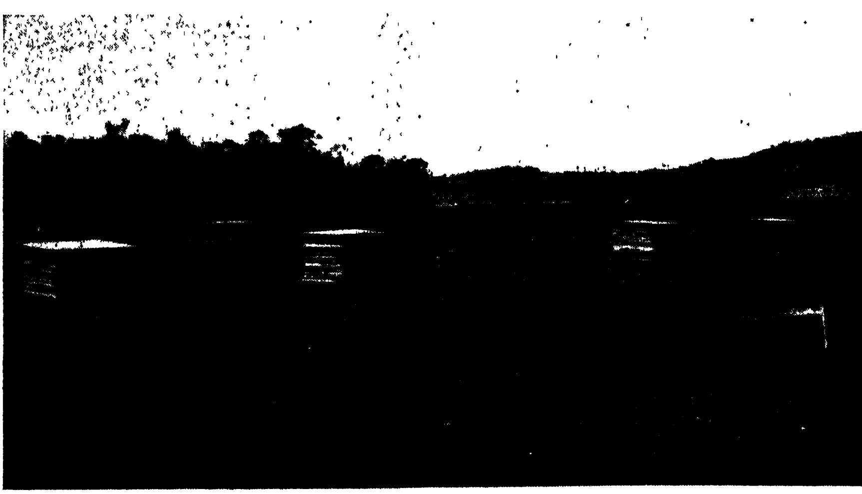


Plate 7.

PORTABLE SHEDS, AN ADJUNCT OF ROTATIONAL GRAZING.

When the area available for the piggery is of sufficient size, the grazing system has many advantages and should be practised or, where the area is restricted, adopted in combination with the intensive system which is convenient for sows and litters.

The chief feature of a grazing system is a number of paddocks, varying in size, depending on the class of grazing and number of stock to be carried. Such paddocks should be in sufficient numbers to allow for rotational grazing and resting and, when suitable, cultivation.

When first-class pasture country is available it is usual to allow ¾ to 1 acre per sow and progeny; but in drier areas and when it is proposed to produce on the farm all the grain required by the pigs it will be found that, in addition to the acre per sow and progeny for grazing, approximately 10 acres per sow to produce the necessary grain and 10 acres for fallow, making a total of approximately 20 acres per sow and progeny, will be required.

Brood sows will gain the major portion of their food requirements from good pasture or forage crops, but sows and litters must be given a full allowance of concentrated foods even when they have access to good pasture.

Growing pigs on pasture or forage crops secure minerals and vitamins which are frequently lacking under the intensive system; pigs kept under the latter system often suffer from deficiencies, unless the rations fed are properly balanced.

Because the grazing system does not necessitate constant cleaning, labour is saved and pig-raising is more congenial than under the intensive system. It has been demonstrated that under the grazing system pigs can be satisfactorily produced to market weights without the use of finishing pens provided they are bred and fed correctly. The old practice of enclosing pigs in small pens to fatten is gradually disappearing, especially now that the markets are demanding a much leaner and longer pig than was the case years ago.

The cost of accommodation must be taken into account, giving due consideration to the capital available and anticipated returns, but should be calculated on a cost per head basis of each pig likely to be produced in the piggery. Such a cost will usually be found to be low and it is more often than not false economy to save a few pounds in the initial outlay, when such a saving may mean slower growth, greater labour costs and greater risks from disease.

It is estimated that good housing on a small piggery will cost approximately £25 to £35 per sow for capital outlay and this, spread over, say, 15 years and taking into consideration the number of pigs likely to be produced, is a very small part of the total cost of production.

In selecting the site for the piggery the aspect chosen should provide shelter from prevailing winds and at the same time make the maximum use of sunlight, which is the cheapest and best disinfectant. Usually a northerly or north-easterly aspect will be found the most suitable, but drainage away from the piggery is a distinct advantage. Other points which should be borne in mind are water supply, shade, and proximity to cultivation land.

On every farm where pigs are bred and reared a certain number of paddocks or pens are necessary, so that pigs of various classes may be kept separately. Brood sows when dry should be run in separate paddocks from other pigs and it is recommended that forward sows or springers be separated from sows just mated.

Dry sows will secure the greater part of their food requirements from good grazing and give the best results when allowed plenty of exercise and are kept in the open.

Sows and litters are best kept in individual pens with exercise yards attached, but, as it is not always possible to allow each sow and litter an enclosure large enough to be cultivated, the intensive system is usually resorted to. However, sows and litters may be kept separately on pasture by the use of movable pens, such pens being built on skids and providing a shed and exercise yards, the whole unit being moved to fresh pasture as each patch becomes fouled.

All farrowing pens should be fitted with a farrowing or guard rail, placed 9 inches from the floor and 9 inches from the walls, so as to prevent young pigs from being overlaid. When the young pigs are

3 to 4 weeks old they should be fed supplementary foods behind a creep, either by the use of a small self-feeder or in troughs. This system of creep-feeding will greatly assist the young pigs and minimizes setbacks at weaning time. It also relieves the sow of some of the strain of suckling the litter and she is usually in much better condition to be returned to the boar 3 or 4 days after the litter has been weaned.

After weaning, the sow should be returned to the dry sow paddock and the weaners drafted into the grazing paddocks where they should remain until ready for market.

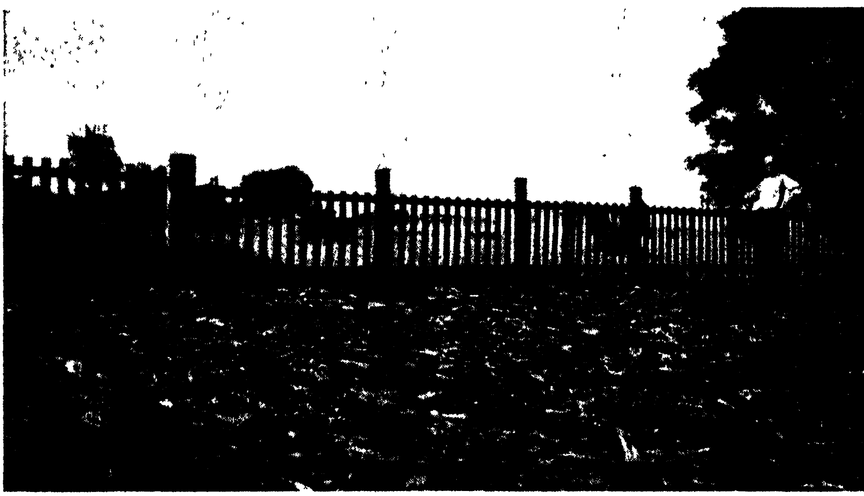


Plate 8.

PALING FENCE FOR ENCLOSING BOAR RUN AND SMALL YARDS.

Fencing.

The class of fence to be used will be largely governed by the district and the material available.

Pig fences should be from 3 to 4 feet high, depending upon the class of pig to be enclosed. Sows and boars sometimes have a tendency to jump and for such animals, particularly boars, a 4-foot fence is recommended. However, fences 3 feet high are usually of sufficient height to control pigs of all sizes.

Post-and-rail fences are the best for boar pens and small yards; the material used being split posts and rails or split posts and 6 inch by 1 inch rough-sawn hardwood as rails, fastened to the inside of each post, or sawn hardwood posts may be used.

For grazing areas, special woven-wire pig fencing is usually the best and there are a number of makes on the market which will be found suitable. Heavy-gauge netting may also be used; while seven or eight barbed wires, suitably spaced, is fairly satisfactory but objectionable where young pigs are to be penned.

Where wire fences are used it is a wise practice to construct or reinforce them with wood at the feeding section and gateways as there is the most wear and tear on these parts of the fence.

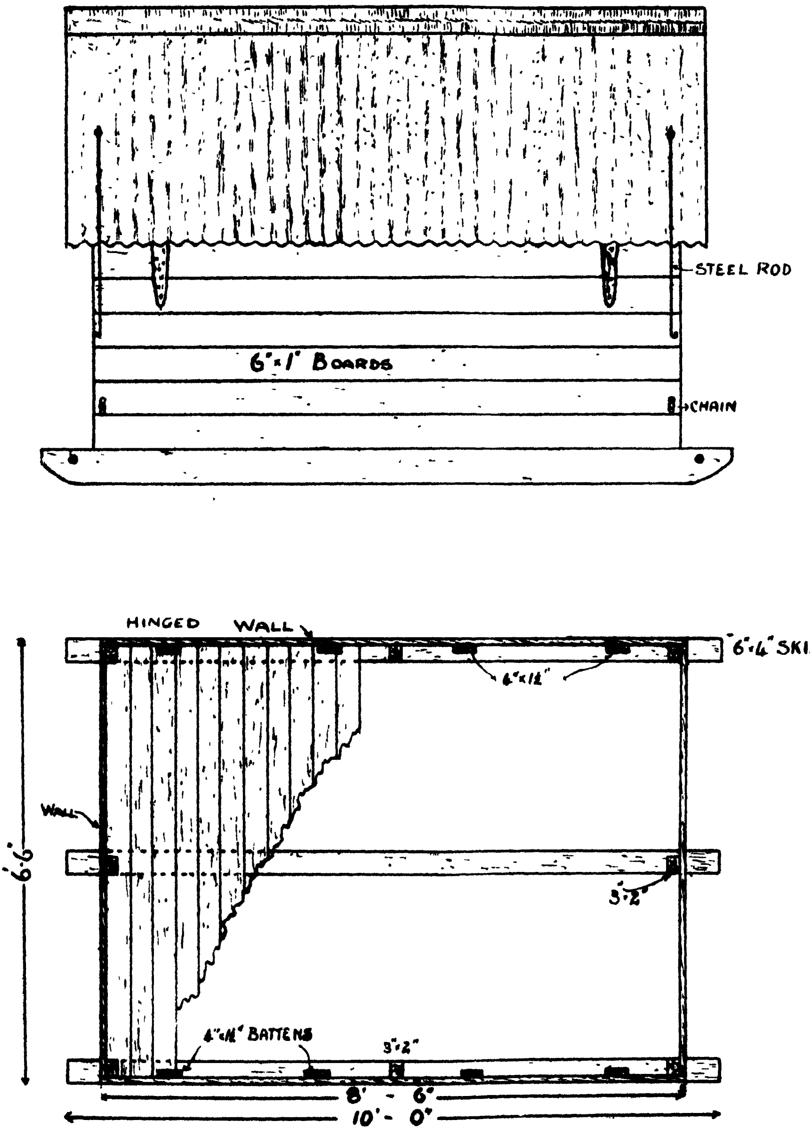


Plate 9.

PLAN AND SIDE ELEVATION OF PORTABLE SHED WITH HINGED SIDES. (See Plate 10.)

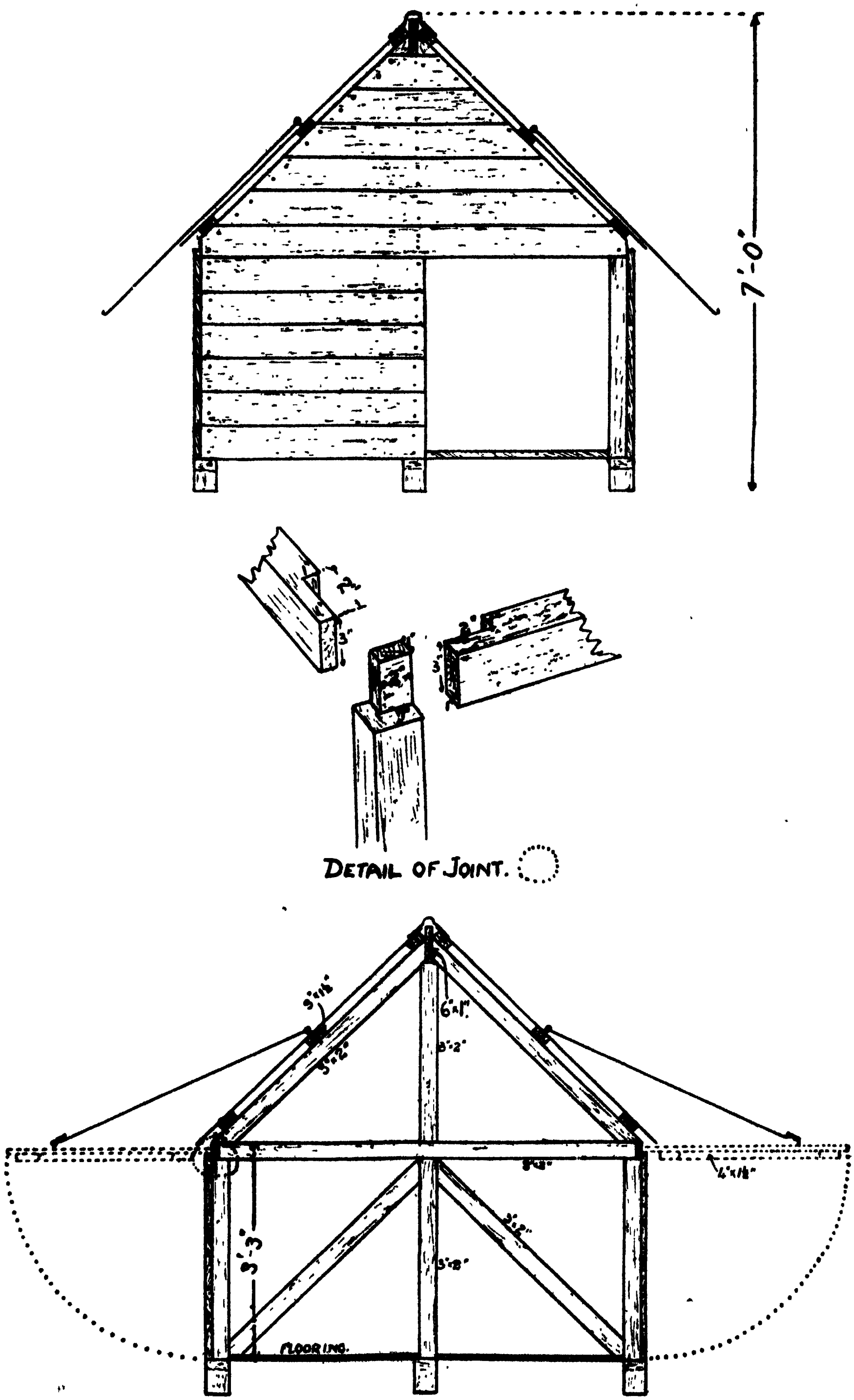


Plate 10.

END ELEVATION AND DETAILS OF PORTABLE SHED WITH HINGED SIDES. (See Plate 9.)

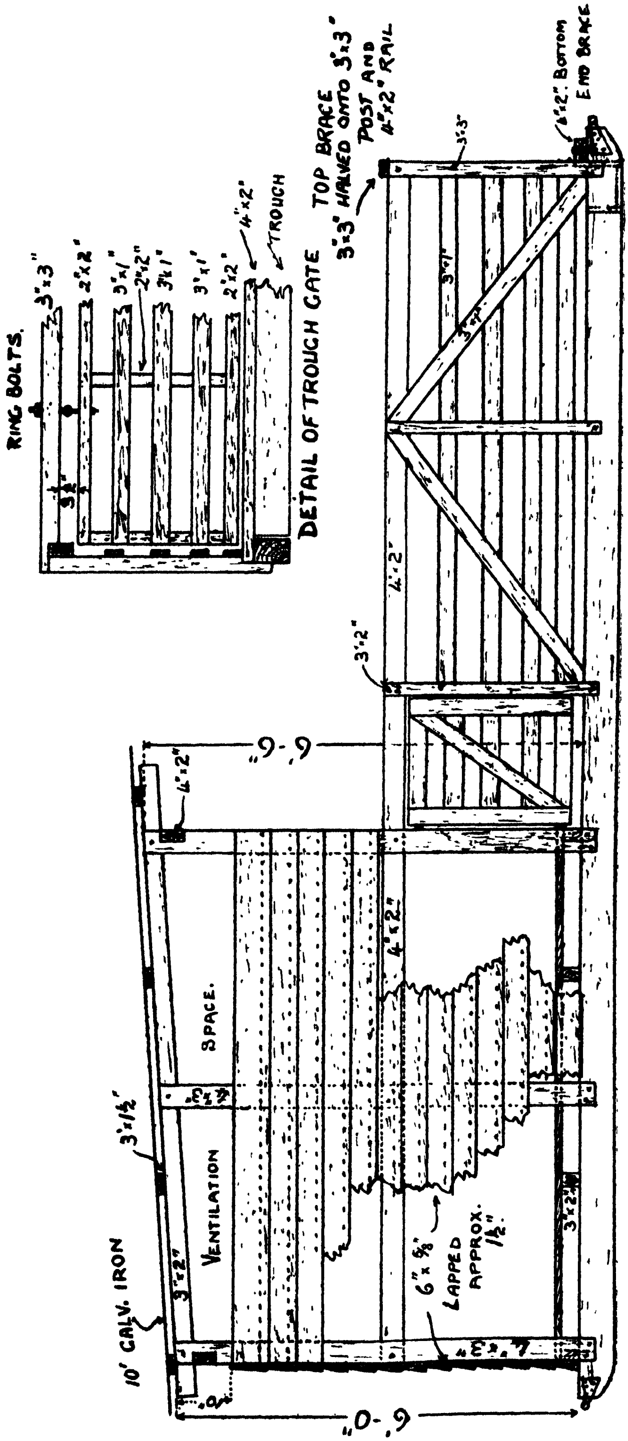
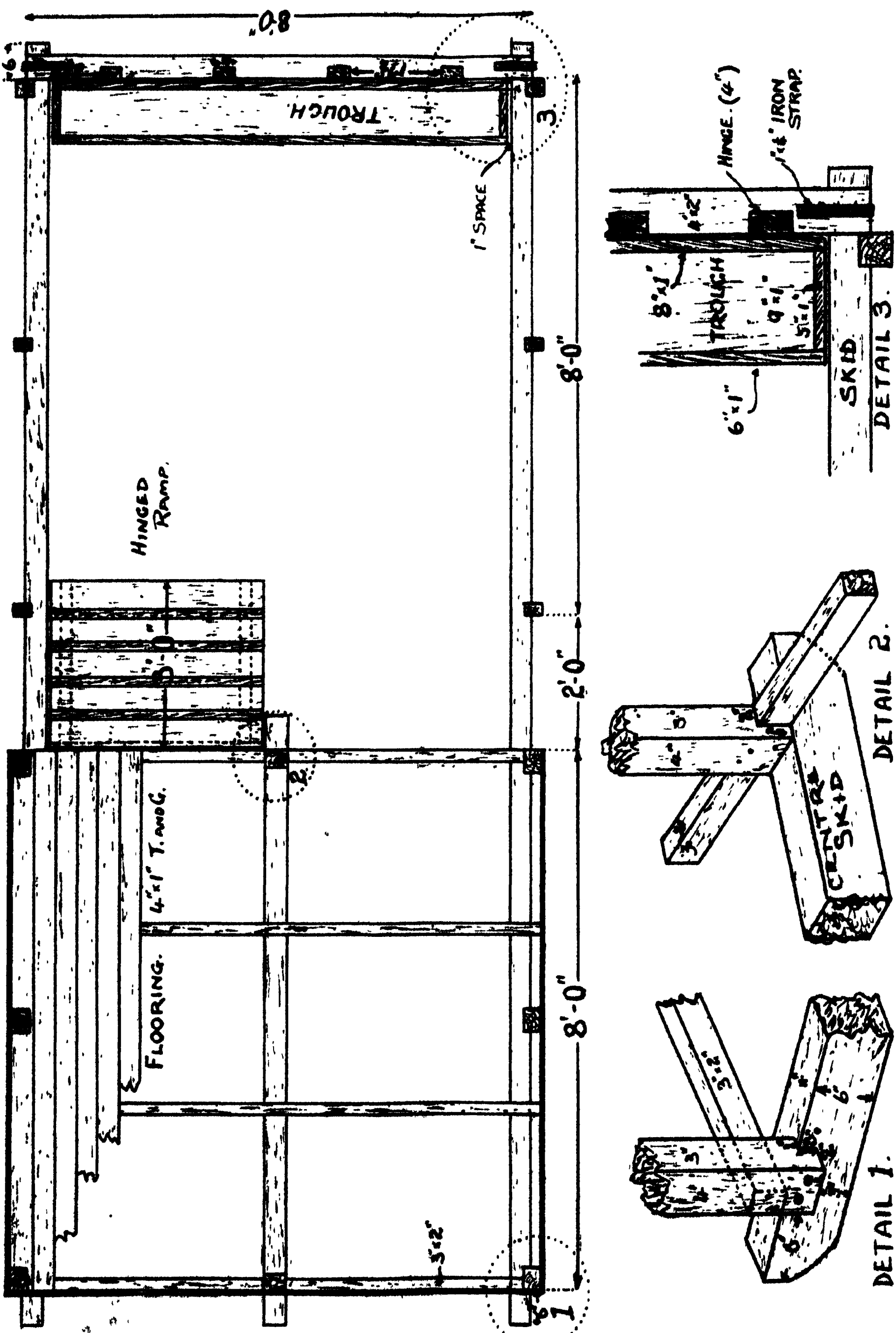


Plate 11.

SIDE ELEVATION OF COMBINED PORTABLE SHED AND RUN. (See Plate 12.)


8'0"
TROUGH
1" SPACE
HINGED RAMP
3'0"
8'-0"
2'-0"
8'-0"
FLOORING.
4"x1" T. AND G.
3"x2"
HINGE (4")
1¼" IRON STRAP
8"x1"
TROUGH
6"x1"
SKID
DETAIL 3.
CENTRE SKID
DETAIL 2.
DETAIL 1.

Floors.

Pigs require sleeping floors that are hygienic, but which in cold weather are warm. As tongue-and-groove timber floors, which are usually recommended, are only reasonably sanitary and durable, consideration should be given to the construction of concrete floors that are in some way insulated against moisture and cold rising from the ground.

Overseas, considerable experimentation and thought has been given to such floors, and the following two methods of construction have been reported to give satisfactory results.

The first of these is the air-cell type, constructed by laying down rows of 4-inch agricultural pipes and covering these with a thin layer of concrete. The effect is to create an air-warmed floor, in which the air trapped in the pipes is warmed each night by the bodies of the sleeping pigs and remains warm for a considerable period, on the same principle as the thermos flask.

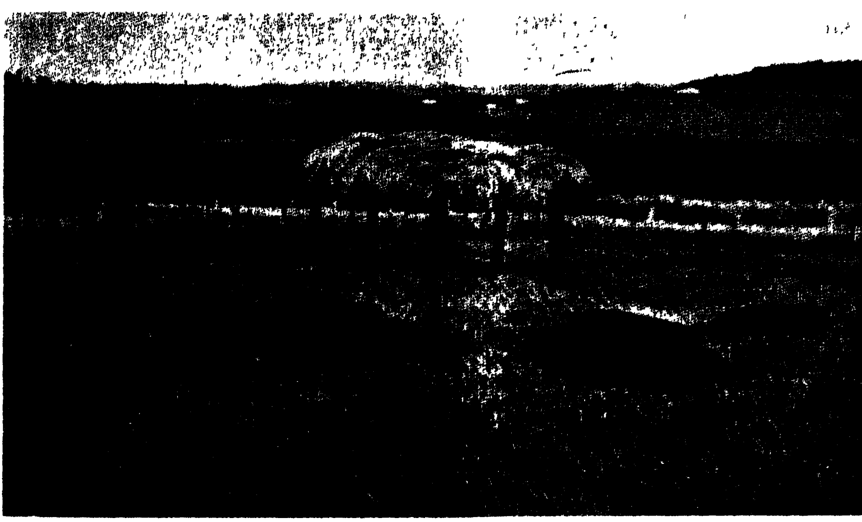


Plate 13.

A PADDOCK OF KIKUYU GRASS PROVIDING EXCELLENT GRAZING FOR PIGS.

The second plan, which is claimed to be cheaper and more efficient, provides for the laying down of a loose rubble base for the purpose of breaking the capillary moisture system from the ground. A system of continuous air-cells embedded in thin concrete is then built by laying down 4-inch half-round wooden mandrels or cores, about 3 feet long, which are embedded in the concrete composed of coke breeze and cement.

As the floor progresses the mandrels are pulled out about 30 inches, thus making a continuous pipe system but without using pipes. Each section is firmly bedded down before withdrawing the mandrels and the ends of the tubular cavities are sealed. The concrete around the mandrels is made of six parts of coke breeze to one part of cement; but the top inch layer to finish the floor is made of a finer breeze and double strength (3 to 1).

Troughs.

A piggery should be equipped with troughs of sufficient capacity to feed the pigs without scrambling and fighting at feeding time, 10 inches to 12 inches of trough space being allowed for each pig.

All troughs should be strongly constructed and have a smooth surface free from cracks and, when a fixture, be surrounded by a feeding floor to prevent the pigs from making mud wallows beside the trough.

Half-round glazed pipes set in concrete or well-finished concrete troughs are best. However, good sawn hardwood well joined, pitched and tarred before being put into use, make very satisfactory troughs; but troughs cut out of a log are not satisfactory, because they split and crack and are impossible to keep in a sanitary condition.

Plate 14.

CONCRETE OR WOODEN FEEDING FLOORS IN A PIGGERY HELP TO KEEP PIGS HEALTHY.

Self-feeders.

Self-feeders are simply devices by means of which a supply of grain or other feeds may be kept constantly available to the pigs in order that they may satisfy the cravings of their appetites.

Self-feeders are practical when grain is being fed and for this purpose are intended for use more especially during the growing and finishing stages in the life of pork and bacon pigs. They are not specially recommended for feeding brood sows.

Of whatever type, they should be designed primarily to keep an available supply of grain constantly before the pigs and at the same time protect the contents against waste due to wind and rain.

A self-feeder consists of a hopper to hold the food and a trough below into which the grain is allowed to flow. The amount permitted to flow into the trough is regulated.

Self-feeders should be placed on a concrete or wooden platform and if well constructed should give satisfactory service for many years. However, a self-feeder is by no means a substitute for a knowledge of

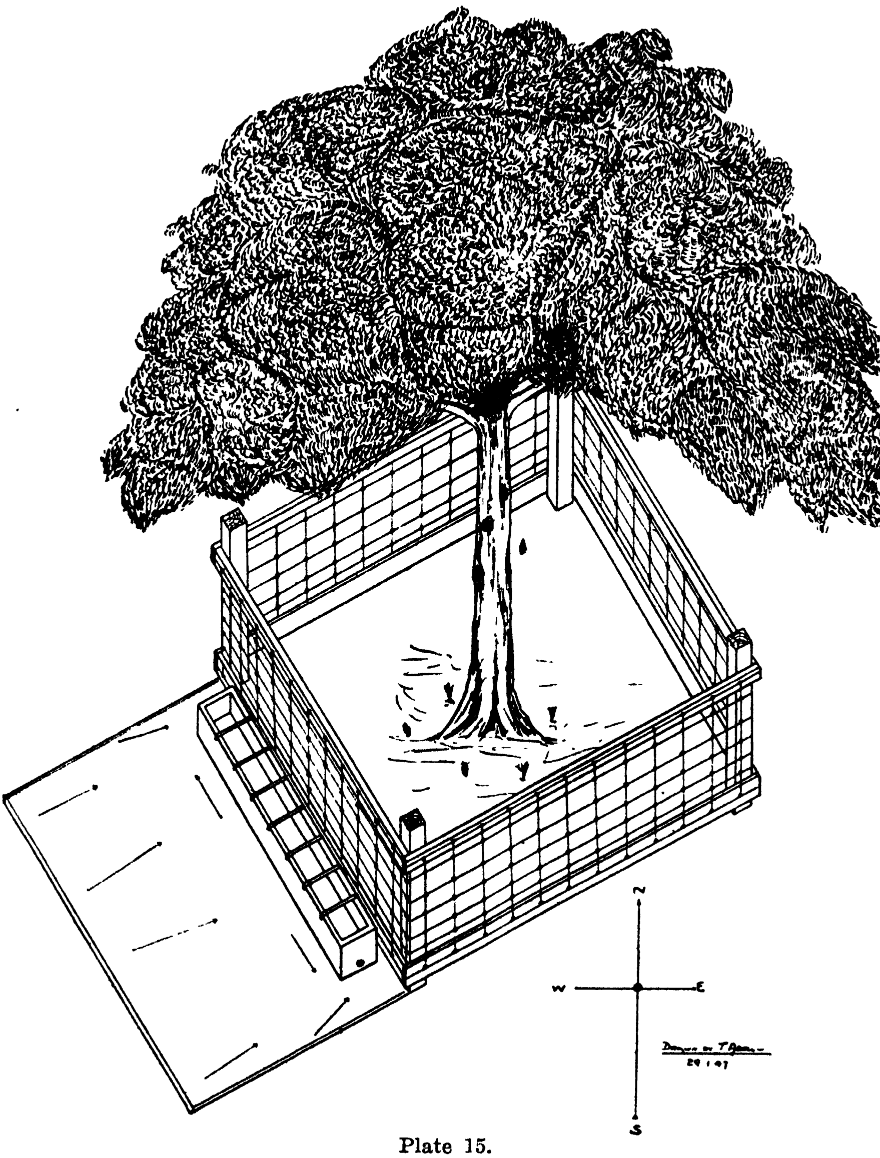


Plate 15.

PLAN OF COMBINED TREE-SHADED AREA AND WATER TROUGH.—A shed may also be built to take advantage of the shade.

feeding and must not be neglected. The old adage, "The eye of the master fattens his cattle," holds good when applied to self-feeding of pigs.

Shade.

Pigs should be provided with ample cool shade in summer and protection from cold winds in winter and this can be done by either planting trees, shrubs, or hedges, or by building a hardwood framework about 4 feet high and covering the top with bushes or thatching with grass.

Concrete.

Concrete floors, &c., in piggeries should be set on good solid foundations and surfaces should be rough-finished to give the pigs a grip and prevent slipping.

To check the action of acid from milk and other foods and to make concrete more waterproof, it may be given three applications of silicate of soda (quartzite) as the concrete is setting. This treatment will prolong the life of concrete floors and troughs. The usual method of application is to mix 1 gallon of silicate of soda with 4 gallons of water and spray or paint it on the concrete when just beginning to set and follow by two other dressings at intervals of about 24 hours.

Loading Race.

Provision should be made for a loading race conveniently placed. It should be approximately 22 inches wide inside measurement, so that pigs are unable to turn round once they have entered the race. Whether the race is a permanent fixture or portable will depend largely upon the lay-out of the farm.

Quarantine Pen.

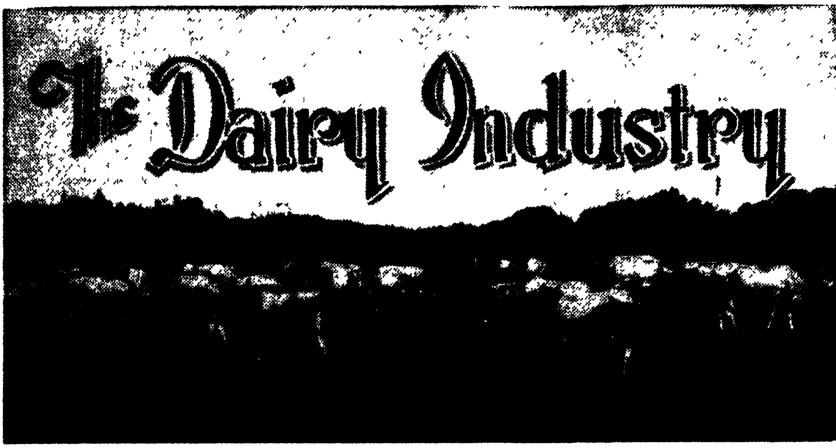
It is advisable and strongly recommended that every piggery be provided with a quarantine pen, well drained and placed some distance from other pens and yards, where newly introduced pigs and sick pigs can be placed and kept under observation. Such a pen is an important safeguard against outbreaks of disease.

It is desired to acknowledge the valuable assistance given by Mr. T. Abell, Adviser, Pig Branch, Atherton, who drew the plans reproduced in this article.

This article will be published in pamphlet form with a complete set of plans and specifications. Copies, when they become available, may be had on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Plate 16.

A "BLOW" FOR THE TEAM.



Queensland Butter Production.

E. B. RICE, Division of Dairying.

IN the year ended 30th June, 1947, factory-made butter aggregated 74,068,021 lb. of an estimated value of £6,069,327. This was the lowest butter output in Queensland since the 1928-1929 season, and was slightly less than half that of the record season of 1938-1939, when 154,377,535 lb. was produced. Although the abnormally dry season was the main cause of the decline in butter output in the season under review in comparison with that of the preceding season, comparisons of butter production for recent years give a false impression of the decline in dairy production. Over a period of years there has been a pronounced diversion of milk to the market milk trade and the cheesemaking and ice cream trades—all at the expense of butter. This is clearly brought out in the following table which was submitted to a recent meeting of the Victorian Division of the Australian Society of Dairy Technology:—

APPROXIMATE PER CAPITA CONSUMPTION OF DAIRY PRODUCTS IN AUSTRALIA.

Product.	Pre-war.		1946.	
	—	Milk galls. Millions.	—	Milk galls. Millions.
Butter	32 lb.	450	26 lb.	370
Cheese	4½ lb.	32	7 lb.	50
Fresh Milk	158 pints	147	200 pints	190
Ice Cream	1 gall.	7	1½ gall.	10
Milk Powder and Milk Products..	3 lb.	20	5 lb.	35
Total		656		655

Grading.

The results of all Queensland butter graded by Commonwealth and State graders are summarized as follows:—

—	Boxes.	Per cent.
Choice grade	332,552	32·46
First grade	612,135	59·75
Second grade	72,503	7·08
Pastry grade	7,303	·71

This quantity represents 77.46 per cent. of the total production. It is thus seen that the grading figures may be expected to give a fair reflection of the quality of Queensland butter.

During the war years emphasis was placed on increasing the volume of dairy production rather than on maintaining quality. While the need still exists for increasing production in order to meet the needs of food-hungry nations, it is equally necessary to strive to produce butter of uniformly high quality. The marked downward trend of butter quality in recent years is greatly to be deplored. Action to arrest this decline is urgently necessary. In this regard, the full co-operation of the advisory services of the Division of Dairying are available; but success can only be achieved by the united efforts of all sections of the industry.

In the butter factories the deterioration of factory equipment, through the inability in recent years to carry out normal maintenance and effect renewals, is partly to be blamed for lowered butter quality. This factor is, however, considered of much lesser significance than the declining quality of cream supplies and the tendency among factories to a lenient grading of cream. Some factories fail to realize their obligation to adhere to cream-grading standards. This is evident from the percentage of butter which is not passed by Commonwealth and State graders as true to the quality packed. Naturally, any farmer who is credited with choice grade for cream not of that quality is falsely led to believe his shed methods are satisfactory. This shortsighted policy does a serious disservice to the industry. It hinders departmental efforts to assist in the improving of cream supplies, as borderline suppliers will show their factory cream-grade dockets as evidence of taking the requisite care to produce sound-quality cream. It is, too, directly opposed to what must be the ultimate objective of the Australian dairy industry—butter of one uniform quality comparable at least with that of its chief competitors.

Farm Refrigerators.

In connection with quality improvement, the efforts of the Queensland Butter Board to foster the use of refrigerators for cooling milk and cream on dairy farms are deserving of commendation. The Board has set up a refrigerator manufacturing department and is now assembling units for supply to dairy farmers at cost price. A long-term hire-purchase plan will enable any dairyman to instal a refrigerator on a low deposit and to repay the purchase price over an extended period. The ordinary milking-machine engine provides the motive power.

Weed Taints.

Field officers of the Division have co-operated with officers of the Council for Scientific and Industrial Research in investigations commenced in the course of the year on weed taints in dairy produce. These taints have caused heavy degrading of butter in recent years.

Officers of the C.S.I.R. are carrying out feeding trials at the Queensland Agricultural College with some of the more widely occurring weeds. Modifications in manufacturing technique, especially lower pasteurizing temperatures, will also be carried out, with a view to ascertaining if the intensity of taint can be minimized.

Mottles.

This defect was again prevalent in the output of some factories. The whole subject of body and texture of butter and its relationship to keeping quality is being investigated in the Dairy Research Branch. The findings should be of great practical and economic value. It is fairly clear from experimental work in factories during the year that mottling most commonly, if not always, occurs in butter in which, through insufficient working, the moisture droplets are large. The existence of mottles has not been observed in well-worked butter in which, because of effective working, moisture droplets have been finely dispersed. By careful control of churning temperature, size of butter granule, complete draining at the grain stage and adequate working, the buttermaker should be able to avoid mottling in the resultant butter.

Streaky Butter.

This defect was a cause of some degrading. With the large modern churns of up to 100 boxes capacity, butter may remain longer in the churn room before packing. Consequently, there is some risk of the exposed surface of the butter becoming softened in the summer months and, when put through the butter packer, causing a streaky condition throughout the mass. Temperature-controlled packing rooms are desirable in the Queensland climate.

New Ways of Making Butter.

Much interest is being evinced in the several new processes for making butter developed during the war years in several countries, including the Australian "New Way" process. These methods dispense with the churn, the age-old means of changing cream into butter, and seem better adapted to the handling of milk and fresh or "sweet" cream, rather than self-ripened, or sour, cream. Because of sparse settlement, road condition and climate, "sour" cream is at present received at all Queensland factories. One of the new machines, developed by Dr. Senn of the Dairy Research Institute in Switzerland, does, however, treat sour cream. To determine the suitability under Australian conditions of these machines, which are based on three different underlying principles, the Australian Dairy Produce Board has arranged for the purchase of four machines which will be installed in factories in Victoria, New South Wales and Queensland. A technical committee has been appointed to supervise the trials. The Senn machine, already mentioned, will be placed in the Caboolture butter factory in this State.

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Butter Improvement Service.

As in former years, the Butter Marketing Board has made a grant of £1,000 towards the cost of laboratory services. Field officers of the Division co-operated fully in providing the necessary liaison between the laboratory and the factories in regard to the Butter Improvement Service.

Imperial Contract and Commonwealth Government Subsidies.

As from 1st July, 1946, the contract price of butter exported to the United Kingdom was raised to 216s. 10½d. per cwt. The contract between the British and Australian governments lasts until 30th June, 1948. Negotiations in connection with the renewal of the contract will possibly be opened when the report of the Dairy Industry Costs Committee is received. Representatives of the industry believe the contract will continue until at least 1950.

The present price, including Commonwealth Government subsidy, expected to return to the producer 1s. 7½d. per lb. commercial butter, was to be reviewed after 31st March, 1947, and the Commonwealth Government has guaranteed the industry that the price for the year ending 31st March, 1948, will not fall below the average price which operated in 1945.

A matter of major interest in relation to the view of prices to be paid producers from April, 1947, was the setting up of a Joint Dairying Industry Committee consisting of representatives of the Commonwealth Government and dairy industry organizations. The Committee is charged with investigating the costs of production of dairy produce. For this purpose, about 1,050 random-selected dairy farms throughout Australia will be thoroughly surveyed. These farms, representing about 1 to 1.5 per cent. of all suppliers to butter, cheese and milk-processing plants, will each be visited by two officers, one nominated by producers and one by the Government. Three hundred and seventy-five Queensland farms are included in the costing survey. Several officers of the Division of Dairying are associated with the Committee in connection with the work to be done in Queensland. It is expected to complete the collection of data from farms by the end of June and the Committee's report on its findings should be placed before the Commonwealth Government soon afterwards. This survey should provide reliable data on dairy-farm production costs. Moreover, certain other data being collected simultaneously with the cost-of-production data should provide factual information on many other aspects of farm management in Australia.

The long-term contract for the sale of the exportable surplus of dairy produce gives a measure of marketing stability never previously known in the Australian dairy industry. Prices of dairy farms are buoyant, indicative of the faith of dairy farmers in the future prospects of the industry.

During the war years and since, all butter distributed in England bore no other description than "National Butter." As from 1st October, 1947, it is now permissible to mark on the wrapper the brand name and country of origin of the butter, in addition to the words "National Butter." The amendment of the Regulations to permit of this new

system of marking was made in response to representations from some of the countries which always marked the country of origin on their produce in pre-war years. This announcement suggests a definite trend back to pre-war methods of marketing in Britain.

The position in respect of Commonwealth Government subsidy to the Australian dairy industry is summarized hereunder:—

Year.	Return to Producer per lb. Commercial Butter.	Return to Producer per lb. Butterfat basis.	Subsidy required and paid by the Commonwealth.	Recoupment from British Government.	Nett cost to the Commonwealth Government.
	s. d.	s. d.	£	£	£
1942–43 ..	1 5½	1 9·27	1,186,306	..	1,186,306
1943–44 ..	1 6	1 9·88	7,346,120	1,439,579	5,906,541
1944–45 ..	1 7·3	1 11·458	6,812,197	2,693,191	4,119,006
1945–46 ..	1 7½	1 11·7	6,373,511	1,654,692	4,718,819
1946–47 ..	1 7½	1 11·7	6,250,000	estimated	6,250,000
			27,968,134	5,787,462	22,180,672

QUEENSLAND BUTTER PRODUCTION.

SUMMARY OF PRODUCTION AND GRADINGS OF BUTTER FOR THE YEAR ENDED 30TH JUNE, 1947.

MANUFACTURE IN LB.

Total.	Choice.	First.	Second.	Pastry.
74,068,021	44,948,166	26,247,252	2,859,760	12,843

PAY IN LB.

74,270,061	46,154,441	25,646,186	2,467,679	1,755

OVER-RUN.

Actual .. .. .. 2,316,431 = 3·22 per cent.

Paid .. .. .. 2,395,493 = 3·33 per cent.

Butter Submitted for Grading.		Grading Result.			
Grade.	No. of Boxes.	Choice.	First.	Second.	Pastry.
Choice	553,044	332,552	219,258	1,117	117
First	422,599	..	392,877	29,500	222
Second	48,425	..	..	41,886	6,539
Pastry	425	..	..	..	425
Totals	1,024,493	332,552 32·46%	612,135 59·75%	72,503 7·08%	7,303 ·71%

Percentage of Production Graded = 77·46 per cent.

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1947

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Atherton	Make	1,258,207	1,258,207	..	..	..	46,795	53,340	6·88
	Pay	1,264,752	1,261,494	..	3,258	..	3·86%	4·4%	
Bushy Creek	Make	6,848	6,848	..	..	..	U/r. 2	46	..
	Pay	6,896	6,896	..	..	..	..	·67%	
Caboolture	Make	1,414,828	1,218,396	196,432	..	..	65,559	59,304	65·85
	Pay	1,408,573	1,267,892	138,969	1,712	..	4·86%	4·4%	
Eumundi	Make	1,476,493	1,340,330	135,966	197	..	46,572	45,484	84·17
	Pay	1,475,405	1,361,989	113,282	134	..	3·26%	3·18%	
Pomona	Make	1,123,643	1,086,340	37,303	..	..	32,539	33,121	92·62
	Pay	1,124,225	1,110,005	13,920	300	..	2·98%	3·04%	
Chinchilla	Make	1,046,712	712,672	239,568	83,384	11,008	18,527	21,555	91·15
	Pay	1,049,740	728,364	249,809	70,761	806	1·81%	2·10%	
Daintree	Make	78,191	78,191	..	..	..	××	..	..
	Pay	84,157	84,157	..	..	..	..	..	
Dayboro	Make	42,019	15,260	26,759	..	..	××	..	..
	Pay	181,442	156,278	25,164	..	..	..	..	
Toowoomba	Make	2,002,728	1,546,552	336,336	119,840	..	65,704	65,704	49·59
	Pay	2,002,728	1,532,286	349,210	121,232	..	3·39%	3·39%	
Clifton	Make	1,108,352	813,792	293,664	896	..	31,741	31,716	95·74
	Pay	1,108,327	814,960	292,502	865	..	2·95%	2·95%	

OFFICIAL GRADINGS IN BOXES.

Factory.	Boxes Submitted As Choice.	Grading Result.				Boxes Submitted As First.	Grading Result.			Boxes Submitted As Second.	Grading Result.		Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Atherton ..	1,525	1,525 100%	..	..	..	..	..	..	..	20	20 100%	..	..
Bushy Creek ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Caboolture ..	13,016	7,358 56·53%	5,658 43·47%	..	..	3,618	2,713 74·99%	905 25·01%	..	2	2 100%	..	..
Eumundi ..	19,882	3,935 19·79%	15,800 79·47%	147 ·74%	..	2,303	978 42·47%	1,318 57·23%	7 ·3%	6	6 100%	..	..
Pomona ..	17,906	7,980 44·57%	9,926 55·43%	..	..	678	389 57·37%	289 42·63%	..	..	..	..	..
Chinchilla ..	11,084	6,261 56·49%	4,798 43·29%	25 ·22%	..	4,278	3,078 71·95%	1,200 28·05%	..	1,447	1,229 84·93%	218 15·07%	228
Daintree ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dayboro ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Toowoomba ..	10,771	9,470 87·92%	1,301 12·08%	..	..	5,969	5,846 97·94%	123 2·06%	..	994	936 94·16%	58 5·84%	..
Clifton	13,651	12,386 90·73%	1,265 9·27%	..	..	5,282	5,275 99·87%	7 ·13%	..	16	16 100%	..	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1947—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Crow's Nest	Make	1,224,048	748,608	463,680	11,760	..	37,075	37,106	96·05
	Pay	1,224,079	748,878	464,398	10,803	..	3·12%	3·13%	
Dalby	Make	1,751,182	656,886	1,017,016	74,256	3,024	61,564	61,498	78·62
	Pay	1,751,116	649,372	1,040,641	61,103	..	3·64%	3·64%	
Goombungee	Make	1,169,840	519,848	606,368	43,624	..	32,875	32,853	97·2
	Pay	1,169,818	520,872	605,711	43,235	..	2·89%	2·89%	
Jandowae	Make	1,325,293	481,656	752,301	91,336	..	38,823	38,823	95·64
	Pay	1,325,293	481,659	752,330	91,304	..	3·02	3·02%	
Miles	Make	507,808	45,136	284,536	178,136	..	13,176	13,191	73·43
	Pay	507,823	45,151	284,644	178,028	..	2·66%	2·67%	
Esk	Make	1,967,785	806,647	1,097,553	63,585	..	40,915	41,564	96·46
	Pay	1,968,434	820,609	1,093,469	54,356	..	2·12%	2·16%	
Evelyn Tableland ..	Make	307,416	307,416	..	..	..	10,424	10,387	14·12
	Pay	307,379	306,593	257	529	..	3·51%	3·5%	
Gayndah	Make	1,082,510	649,518	411,712	21,280	..	39,081	39,195	94·24
	Pay	1,082,624	647,606	416,432	18,586	..	3·75%	3·76%	
Killarney	Make	1,363,366	1,085,701	224,073	53,592	..	30,075	29,905	73·41
	Pay	1,363,196	755,576	550,941	56,679	..	2·26%	2·24%	
Logan and Albert ..	Make	2,658,964	2,188,950	462,902	7,112	..	133,224	133,684	92·37
	Pay	2,659,424	2,243,869	409,110	6,445	..	5·28%	5·29%	

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Grading Result.				Boxes Submitted As First.	Grading Result.			Boxes Submitted As Second.	Grading Result.		Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Crow's Nest ..	12,489	9,491 75·99%	2,998 24·01%	..	..	8,295	7,887 95·08%	408 4·92%	..	210	210 100%	..	..
Dalby	7,752	6,525 84·17%	1,227 15·83%	..	..	15,507	14,720 94·92%	787 5·08%	..	1,292	1,040 80·5%	252 19·5%	34
Goombungee ..	8,946	6,138 68·61%	2,808 31·39%	..	..	10,583	10,090 95·34%	493 4·66%	.. ..	777	459 59·08%	318 40·92%	..
Jandowae ..	7,718	5,354 69·37%	2,364 30·63%	..	..	13,286	12,951 97·48%	335 2·52%	..	1,630	1,287 78·96%	343 21·04%	..
Miles	20	20 100%	..	..	..	4,010	3,256 81·2%	737 18·38%	17 ·42%	2,629	1,625 61·81%	1,004 38·19%	..
Esk	13,045	9,264 71·02%	3,781 28·98%	..	..	19,426	18,560 95·54%	866 4·46%	..	1,425	1,068 74·95%	357 25·05%	..
Evelyn Tableland	126	126 100%	..	..	..	636	636 100%	..	..	..	..	..	13
Gayndah ..	10,601	6,563 51·91%	3,945 37·21%	93 ·88%	.. ..	7,254	5,974 82·35%	1,273 17·55%	7 ·1%	363	323 88·98%	40 11·02%	..
Killarney ..	7,310	5,853 80·07%	1,457 19·93%	..	..	9,399	9,339 99·36%	60 ·64%	..	1,163	1,063 91·4%	100 8·6%	..
Logan and Albert	36,911	15,100 40·91%	21,659 58·68%	152 ·41%	..	8,374	6,107 72·93%	2,267 27·07%	..	127	83 65·35%	44 34·65%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1947—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Maleny	Make	1,668,513	1,581,321	85,568	1,624	..	48,418	49,218	90·54
	Pay	1,669,313	1,597,852	67,798	3,663	..	2·99%	3·04%	
Maryborough	Make	579,731	408,422	154,369	16,940	..	× ×	..	23·70
	Pay	585,149	410,780	157,598	16,771	..	..	..	
Biggenden	Make	1,258,971	788,179	470,792	..	..	62,659	55,738	80·89
	Pay	1,252,050	823,840	428,184	26	..	5·24%	4·66%	
Kingaroy	Make	2,735,872	2,518,592	123,872	93,408	..	139,984	123,901	50·29
	Pay	2,719,789	2,525,679	110,509	83,601	..	5·39%	4·77%	
Mundubbera	Make	1,383,954	1,142,818	184,520	56,616	..	53,461	53,090	88·21
	Pay	1,383,583	1,176,281	167,401	39,901	..	4·02%	3·99%	
Wondai	Make	1,581,870	990,664	538,216	52,990	..	66,017	63,095	76·32
	Pay	1,578,948	1,055,427	485,426	38,095	..	4·36%	4·16%	
Millaa Millaa	Make	596,985	596,985	..	..	..	19,819	18,433	9·17
	Pay	595,599	595,599	..	..	..	3·43%	3·19%	
Milmerran	Make	1,104,297	302,153	641,032	161,112	..	26,808	26,944	93·17
	Pay	1,104,433	319,191	657,977	127,265	..	2·49%	2·5%	
Nanango	Make	1,974,892	559,492	1,349,936	65,464	..	64,273	64,592	94·9
	Pay	1,975,211	697,491	1,227,618	50,102	..	3·36%	3·38%	
Oakey	Make	2,765,328	2,233,720	346,696	184,912	..	83,991	83,644	90·99
	Pay	2,764,981	2,227,588	390,273	147,120	..	3·13%	3·12%	

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Grading Result.				Boxes Submitted As First.	Grading Result.			Boxes Submitted As Second.	Grading Result.		Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Maleny ..	25,406	11,865 46·7%	13,541 53·3%	..	..	1,541	1,401 90·91%	140 9·09%	..	29	29 100%	..	..
Maryborough ..	443	122 27·54%	321 73·46%	..	..	1,711	1,086 63·47%	625 36·53%	..	300	85 28·33%	215 71·67%	..
Biggenden ..	10,128	5,851 57·77%	4,277 42·23%	..	..	8,057	7,321 90·87%	736 9·13%	..	1	1 100%	..	..
Kingaroy ..	20,794	18,809 90·45%	1,958 9·55%	..	..	2,212	2,212 100%	..	..	1,563	1,393 89·12%	170 10·88%	..
Mundubbera ..	17,705	5,615 31·71%	11,907 67·26%	183 1·03%	..	3,256	1,469 45·12%	1,787 54·88%	..	839	493 58·76%	346 41·24%	..
Wondai ..	11,206	9,472 84·53%	1,731 15·45%	..	3 ·02%	9,563	9,136 95·53%	427 4·47%	..	791	766 96·84%	25 3·16%	..
Millaa Millaa ..	736	736 100%	..	..	..	212	212 100%	..	..	30	30 100%	..	..
Milmerran ..	3,999	3,118 77·97%	881 22·03%	..	..	11,483	10,625 92·53%	818 7·12%	40 ·35%	2,880	2,437 84·62%	443 15·38%	11
Nanango ..	8,379	6,951 82·96%	1,428 17·04%	..	..	23,895	23,565 98·62%	289 1·21%	41 ·17%	1,195	1,086 90·88%	109 9·12%	..
Oakey	35,467	19,754 55·7%	15,713 44·3%	..	..	6,183	6,102 98·69%	81 1·31%	..	3,283	3,283 100%	..	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1947—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Bundaberg	Make	1,092,915	399,604	693,311	..	..	22,186	24,859	54·94
	Pay	1,095,588	408,499	686,689	239	161	2·07%	2·32%	
Gladstone	Make	799,673	159,820	639,437	416	..	19,684	21,286	67·45
	Pay	801,275	207,247	593,564	464	..	2·52%	2·73%	
Mackay	Make	242,031	54,527	185,891	1,426	187	××	..	..
	Pay	247,825	59,808	186,506	1,242	269	..	..	
Monto	Make	1,831,975	669,064	1,098,104	64,807	..	××	..	66·42
	Pay	1,841,803	776,436	1,003,692	61,675	..	..	..	
Rockhampton	Make	988,870	102,385	859,215	27,270	..	..	..	9
	Pay	1,000,770	102,860	871,586	26,324	..	..	..	
Wowan	Make	1,635,429	404,624	1,207,549	23,256	..	35,714	40,598	69·4
	Pay	1,640,313	413,967	1,208,285	18,061	..	2·23%	2·54%	
Biloela	Make	2,368,134	518,862	1,785,768	63,504	..	60,409	62,563	59·19
	Pay	2,370,288	565,448	1,750,211	54,629	..	2·62%	2·71%	
Q.A.H.S. and College ..	Make	51,113	43,553	7,560	..	..	781	809	·21
	Pay	51,141	49,017	1,965	159	..	1·34%	1·61%	
Boonah	Make	3,448,484	1,289,243	1,843,935	315,250	56	131,232	131,118	96·76
	Pay	3,448,370	1,419,168	1,775,565	253,637	..	3·96%	3·95%	
Booval	Make	2,937,231	1,355,861	1,308,496	272,818	56	74,523	79,098	71·94
	Pay	2,942,248	1,222,738	1,489,937	229,573	..	2·60%	2·76%	

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Grading Result.				Boxes Submitted As First.	Grading Result.			Boxes Submitted As Second.	Grading Result.		Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Bundaberg ..	948	786 82·91%	162 17·09%	..	..	9,774	9 534 97·54%	240 2·46%	..	..	..	..	..
Gladstone ..	550	550 100%	..	..	..	9,082	9,030 99·43%	52 ·57%	..	..	..	..	..
Mackay ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Monto	6,017	4,213 70·02%	1,804 29·98%	..	..	14,418	13,966 96·87%	452 3·13%	..	1,292	1,118 86·53%	174 13·47%	..
Rockhampton ..	..	..	..	..	..	1,391	1,333 95·83%	58 4·17%	..	71	71 100%	..	127
Wowan ..	3,538	3,154 89·15%	384 10·85%	..	..	16,340	14,865 90·97%	1,475 9·03%	..	391	108 27·62%	283 72·38%	..
Biloela	2,243	2,064 92·02%	178 7·94%	1 ·04%	..	21,906	21,829 99·65%	77 ·35%	..	882	565 64·06%	317 35·94%	..
Q.A.H.S. and College	..	..	..	..	..	108	81 75·0%	27 25·0%	..	..	..	..	..
Boonah.. ..	21,320	6,078 28·51%	15,044 70·56%	100 ·47%	98 ·46%	32,776	31,132 94·98%	1,644 5·02%	..	5,486	5,309 96·77%	177 3·23%	..
Booval	9,408	6,111 64·96%	3,297 35·04%	..	..	23,601	21,959 93·04%	1,642 6·96%	..	4,726	4,532 95·90%	194 4·10%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1947—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Grantham	Make	1,853,781	510,636	1,131,473	211,672	..	59,823 3·23%	56,658 3·06%	93·99
	Pay	1,853,616	518,452	1,141,682	193,482	..			
Laidley	Make	1,608,566	632,266	925,008	51,292	..	55,566 3·58%	55,614 3·58%	95·37
	Pay	1,608,614	653,935	910,672	44,007	..			
Lowood	Make	788,508	155,146	597,604	35,758	..	28,289 3·72	28,280 3·72%	94·64
	Pay	788,499	164,561	592,722	31,216	..			
Roma	Make	323,637	..	263,381	60,256	..	15,286 4·96%	15,287 4·96%	23·36
	Pay	323,638	69,832	192,240	61,047	519			
Murgon	Make	1,672,235	1,047,631	620,964	3,640	..	56,932 3·52%	56,697 3·51%	75·14
	Pay	1,672,000	1,315,639	353,917	2,444	..			
Proston	Make	793,673	490,041	281,120	22,512	..	30,691 4·02%	31,037 4·07%	91·58
	Pay	794,029	517,805	257,695	18,529	..			
Kingston	Make	3,004,792	1,836,912	1,005,536	162,344	..	93,600 3·22%	93,055 3·20%	100
	Pay	3,004,247	1,891,980	973,852	138,415	..			
Woodford	Make	1,109,222	728,503	361,537	19,182	..	32,796 3·05%	52,112 4·84%	95·2
	Pay	1,128,538	980,868	147.670	..	..			
Allora	Make	1,325,308	1,239,124	86,184	..	..	34,916 2·71%	34,838 2·7%	83·03
	Pay	1,325,230	1,233,201	92,006	23	..			
Inglewood	Make	405,496	192,024	199,920	13,552	..	12,710 3·23%	12,807 3·26%	70·49
	Pay	405,593	153,540	239,233	12,820	..			

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Grading Result.				Boxes Submitted As First.	Grading Result.			Boxes Submitted As Second.	Grading Result.		Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Grantham ..	7,282	2,200 30·21%	5,082 69·79%	..	..	20,115	19,492 96·90%	623 3·10%	..	3,716	3,489 93·89%	227 6·11%	..
Laidley ..	9,867	4,790 48·55%	4,935 50·02%	133 1·34%	89 ·09%	16,486	15,956 96·79%	530 3·21%	..	1,042	829 79·56%	213 20·44%	..
Lowood ..	1,889	1,252 66·28%	637 33·72%	..	..	10,850	10,548 97·22%	302 2·78%	..	587	459 78·19%	128 21·81%	..
Roma	..	..	..	..	..	292	292 100%	..	..	1,046	1,021 97·61%	25 2·39%	12
Murgon	11,344	5,879 51·82%	5,424 47·81%	41 ·37%	..	11,028	10,469 94·93%	523 4·74%	36 ·33%	65	65 100%	..	..
Proston ..	7,472	3,997 53·49%	3,411 45·65%	57 ·76%	7 ·10%	5,128	4,483 87·42%	603 11·76%	42 ·82%	379	261 68·87%	118 31·13%	..
Kingston ..	32,645	15,468 47·38%	17,177 52·62%	..	..	18,234	18,114 99·34%	120 ·66%	..	2,900	2,824 97·38%	76 2·62%	..
Woodford ..	12,073	1,212 10 04%	10,861 89·96%	..	..	6,456	5,385 83·41%	1,039 16·09%	32 ·5%	342	342 100%	..	..
Allora	1,8199	14,044 77·17%	4,155 22·83%	..	..	1,451	1,352 93·18%	99 6·82%	..	..	..	..	..
Inglewood ..	1,301	877 67·41%	424 32·59%	..	..	3,560	3,139 88·17%	421 11·83%	..	243	230 94·65%	13 5·35%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1947—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Mill Hill	Make	1,452,006	1,437,222	1,288	13,496	..	30,339	43,973	28·2
	Pay	1,465,740	1,258,113	194,900	12,727	..	2·13%	3·09%	
Texas	Make	137,317	110,101	15,512	11,704	..	6,684	5,638	19·33
	Pay	136,271	70,740	53,656	11,875	..	5·12%	4·32%	
Cooroy	Make	930,190	732,958	177,016	20,216	..	30,746	30,856	89·56
	Pay	930,300	824,490	98,385	7,425	..	3·42%	3·43%	
Gympie	Make	4,700,789	4,091,120	526,400	83,269	..	173.427	171,117	92·65
	Pay	4,699,638	4,301,863	335,983	61,792	..	3·83%	3·78%	

Factories marked xx have also been dealing in cream, so over-run cannot be given.

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Grading Result.				Boxes Submitted As First.	Grading Result.			Boxes Submitted As Second.	Grading Result.		Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Mill Hill ..	7,053	6,484 91·93%	569 8·07%	..	..	23	23 100%	..	..	236	142 60·17%	94 39·83%	..
Texas	..	..	..	..	..	265	204 76·98%	61 23·02%	..	209	209 100%	..	..
Cooroy	11,373	8,342 73·35%	3,010 26·47%	21 ·18%	..	3,143	2,472 78·65%	671 21·35%	..	360	307 85·28%	53 14·72%	..
Gympie ..	66,896	53,535 80·03%	13,197 19·73%	164 ·24%	..	9,440	6,519 69·06%	2,921 30·94%	..	1,440	933 64·79%	507 35·21%	..

Junior Farmers' Clubs in Queensland.

NO movement in recent years has so captured the imagination of parents and the sympathy and goodwill of rural communities in general, on the score of its educational and character building value, as the Junior Farmers' Club Movement. In the other States of the Commonwealth the organization is firmly established, and its extension to Queensland, where it is already taking root, is warmly welcomed by all associated with the progress of the primary industries and by citizens generally.

Plate 17.
MR. T. L. WILLIAMS.

The success of any such movement depends largely on those directing it and particularly on the man appointed as State Organizer, and the Government has chosen Mr. T. L. Williams, formerly Minister for Agriculture and Stock and Minister for Education, for that important office. Mr. Williams has had a long association with agricultural and educational activities in this State as a teacher, journalist, and parliamentarian representing an important country constituency.

The organization and management of the first five Farm Boys' Camps held regularly during Show Week in Brisbane in pre-war years were entrusted to Mr. Williams by the Royal National Agricultural Association. Under his direction, the Junior Farmers' Club Movement in this State is already gaining momentum. Many applications from the sons of farmers who are either still at school or employed on farms are coming in, and as the new year advances enrolments are sure to increase rapidly.

In the course of a recent interview, Mr. Williams said that never before, perhaps, had it been so necessary to educate youth for rural enterprise. Australia would continue to be dependent on the wealth of her primary industries and, therefore, could not afford to ignore the educational and social needs of those engaged in those industries. If boys were to be asked to remain at home on the farm and become producers themselves they should be given every opportunity of getting practical training based on agricultural science and economics as an inducement to them to "stay put." An urge to obtain wider knowledge and experience was necessary, as well as an incentive to continue

in productive callings. As a former Minister for Agriculture and Stock he had often felt that there was definite obligation to provide training for young people on the land in modern methods of agriculture and to promote a right outlook towards rural pursuits; in addition to facilities already available, he believed that the Junior Farmers' Club Movement would go far towards fulfilling that national obligation.

Continuing, Mr. Williams expressed appreciation of the interest already aroused in the movement throughout Queensland. Club members would be urged to aim at the highest standards and make their own contribution, each in his own way, to the attainment of club objectives. Club membership would be free to boys and girls between the ages of 14 and 20 years, and the team spirit would be fostered in every way. The first school of instruction for club members would open at the Queensland Agricultural High School and College, Lawes, on the 15th, and continue until the 25th of March next. In addition to to periodical schools of instruction, field days would be held on selected farms in different districts and practical demonstrations would be arranged from time to time in co-operation with the advisory staffs of the Department of Agriculture and Stock and the Department of Public Instruction, district branches of primary producers' organizations and the Country Women's Association. It was anticipated that due prominence would be given in the country Press to club activities and cognate matters of news value, as well as in the *Queensland Agricultural Journal* in which, through the courtesy of the Hon. H. H. Collins, Minister for Agriculture and Stock, space would be provided for regular club features.

The success of the Junior Farmers' Club organization in Queensland was already assured, added Mr. Williams, for it was beyond question that extended agricultural education and improved rural amenities were necessary to Australia's economy, in which primary production was of outstanding importance. Moreover, the junior farmers' clubs were among the nation's finest assets.

THE JUNIOR FARMERS' CLUB MOVEMENT.

The Junior Farmers' Club organization was established in New South Wales in 1928, chiefly to check the drift of young people from the land. Its members, boys and girls between the ages of 10 and 21, were provided with definite objectives to induce them to cultivate an interest in the primary industries of their own districts and in their own rural environment. The movement took firm root and spread steadily. Throughout New South Wales there are now no fewer than 360 clubs with an aggregate membership of about 12,000. It also is firmly established in Victoria, South Australia, Western Australia, Tasmania and New Zealand. It should become a live issue in Queensland, where, hitherto, junior farmer work has been confined largely to home project clubs in State schools, especially in country districts. The need for providing means for a continuance of this project work by young people after they have left school is now widely recognised, and this need can be met by the formation of junior farm clubs in every district along the lines which have proved so successful in the South.

There junior farmers have already shown how to grow crops and breed and feed farm animals at less cost, how to conserve soil and its fertility and how to lay foundations of future agricultural prosperity. The building of better farms, better homes and better citizenship are already among their great achievements. On their own home farms club members are putting into practice the scientific principles of farming in all its branches. They have established the beginnings of

quality beef and dairy herds and apply improved techniques in crop production. Above all, they are proud of the fact that they are farmers and that farming is their chosen life vocation.

Between the schools and the home close contact is maintained. This is more effective than appears at first sight. Parents realize that their boys and girls are being treated as individuals, with individual tastes and inclinations; and there is a carry-over from the schools to the home which stimulates interest and confidence between both parents and their growing children. Development of the spirit of co-operation, community service, leadership and personal character are diligently fostered.

Field days on district farms are frequently arranged, and every district show has full entries from club members. Club interests are not entirely agricultural, for members also take an active part in the social life of the whole community. Debates, films, dances, excursions, camps and organized games are all included in regular club activities.

Character training is largely developed by the need for perseverance and hard work in carrying out club projects. Capacity for real work and pride in the job is inculcated on the principle that high wages and improved standards of living are ineffective, unless accompanied by a desire to put maximum effort and pride into the tasks undertaken.

Among other achievements of the junior farmers' clubs in the South are heavier crop yields over district averages; improvement in local agricultural practice; higher standards in country show exhibits; closer personal contact between junior farmers and their seniors at field days, show committee and council meetings; a steady increase in enrolments at agricultural high schools and colleges; and a decided stimulus in the development of advanced agricultural education leading to a more complete country life.

In regard to agricultural education particularly, these southern junior farmers' clubs have, very appropriately, initiated a vigorous drive for more secondary agricultural education for rural communities, and so provide opportunities for club members to become expert farmers and leaders in their own industry with a sound technical background. In every district the clubs have the assistance of local advisory committees of farmers and townspeople who give to them voluntary, effective and ungrudging service.

As to the future of the Junior Farmers' Club Movement, one young club member from the Northern Rivers (N.S.W.) speaking with every confidence put it to the Editor of the *Queensland Agricultural Journal* in this way: "The future responsibilities and opportunities of the J.F.C. for usefulness are immense and they will be rather an important factor, in my opinion, in developing our future agricultural production which is as necessary as industrial production. There is no reason why agriculture should not be on the same footing economically as other industries, for farmers, including junior farmers, are entitled to fair prices for the things they grow and to living standards and amenities comparable with those of their fellow citizens engaged in other industries."

The main object of the Junior Farmers' Club Movement is to keep farmers' sons and daughters on the land and, through vocational agriculture, enable them to develop their love of the land and their latent ability to become successfully established in farming for themselves. *"Learning to do; doing to learn; earning to live; living to serve."* That is their motto.

MARKETING

Production Trends.

Substantial rain fell in all farm and dairying districts during December, with sultry weather, accompanied by frequent storms, being experienced towards the end of the month.

The wheat harvest has been finalised. Frequent storms interrupted harvesting in the later stages, and caused some losses of grain both in the ear and in bagged wheat. However, the crop will exceed 10,000,000 bushels, which is a record for the State.

Farmers continued the plantings of general summer crops, including maize, grain sorghum, pumpkins, peanuts, fodders, &c., all of which are expected to return good yields.

Milk and cream supplies during December reached a level considerably higher than that for December, 1946. Butter production for December is estimated at 12,600,000 lb., as compared with 6,663,245 for December, 1946.

By the end of December, 15,000 tons of No. 1 grade potatoes had been marketed, comprising the bulk of the crop, which is expected to reach 18,000 tons.

The area planted to grain sorghum in the South Burnett by the end of December was estimated at 6,000 acres, and further plantings were expected during January. Crops in this area are making good progress. The acreage planted on the Darling Downs is less than that for last season, and yields are expected to be light.

Marketing of Primary Products.

An increasing demand for more and more regulatory control—in the interest of either grower, retailer or consumer—is some proof (if proof is needed) that our system of marketing primary produce leaves a lot to be desired.

Persistent demand for introduction of a docket system to check sales, for instance, evidences concern by growers that they are not always rendered a true account of what their produce brings. Growers who contract with retailers—particularly retailers in country towns—for direct sales of produce can produce further proof to support this claim.

Country retailers who obtain supplies from Sydney markets invariably pay more than suburban retailers, even after taking into account additional freight and handling charges. This is rarely, if ever, discernible on account sales rendered to growers whose produce finds its way to country centres. Further, prices paid by consumers contrast so oddly with returns to growers as to suggest that all is far from right with our system of distributing primary products.

It could be that the present system is basically wrong. In secondary industries, for example, the aim is to disperse to consuming centres products of those industries immediately they are manufactured. In primary industries the opposite process operates. Immediately products are harvested (call it "manufactured" if you like) they are hurriedly transported to a congested central market. Up to that stage, distribution is in reverse gear, and when subsequently it does get under way, it is dependent on a "come and get it" system, so different to the highly organised distribution methods of secondary industries.

That we have never had decentralised markets (suburban and country) is no argument against their establishment now. This may not be a complete answer to our present marketing-of-primary-products problem, but it would seem to offer more than is likely to be achieved by any attempt to patch-up the present system.—*Agricultural Gazette of New South Wales.*

GENERAL NOTES

Staff Changes and Appointments.

Mr. C. H. P. Defries, B.Com., H.D.A., A.F.I.A., Production Statistics Officer in the Marketing Division, has been appointed Assistant Director of Marketing, Marketing Division, Department of Agriculture and Stock

Banana and Papaw Levies.

The Executive Council has approved of the extension of the banana and papaw levy regulations under the *Fruit Marketing Organisation Acts* for a further period until 31st December, 1948. The sums raised by these levies are expended by the Committee of Direction of Fruit Marketing in the interests of the banana and papaw growers.

The banana levy is at the rate of ½d. per case containing 1½ bushels or less, or 1d. for every £1 of gross realisations where bananas are marketed in the bunch.

The existing papaw levy is at the rate of 1d. for every two cases, or 3s. 4d. per ton where the fruit is delivered to factories. An amendment of the regulation which has also been approved now provides for an additional levy of ½d. per case on papaws marketed south of Rockhampton, and a further 3s. 4d. per ton on factory papaws.

Council for Scientific and Industrial Research—Appointment of Mr. Bell.

The Acting Minister for Agriculture and Stock (Hon. A. Jones) has announced that advice has been received from the Prime Minister's Department that Mr. Arthur F. Bell, Under Secretary of the Department of Agriculture and Stock, had been appointed a council member of the Commonwealth Council for Scientific and Industrial Research and also Chairman of the Council's Queensland State Committee. Mr. Jones said that this appointment was a compliment to both Mr. Bell and the Department, as this was the first occasion on which a departmental officer from any of the States had been appointed to the Council. He anticipated that in his dual capacity as Under Secretary and Chairman of the Council's State Committee, Mr. Bell would be able to do much towards co-ordinating agricultural researches in Queensland. Mr. Bell has acted as a co-opted member of the Council for some time.

T.B. Testing of Dairy Herds.

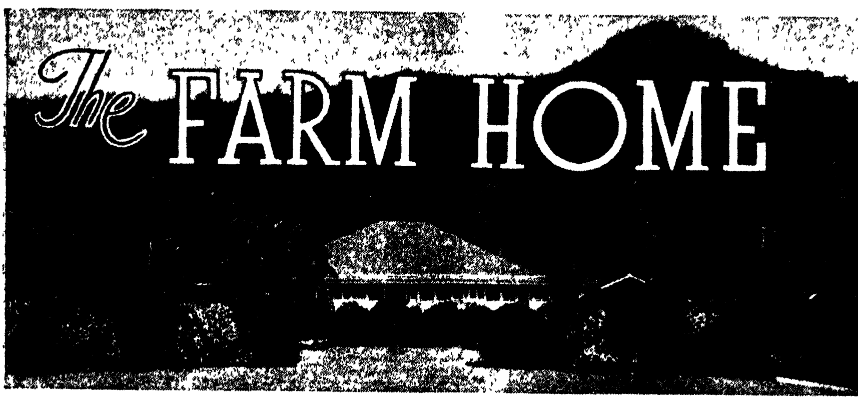
The need for accelerating the tuberculin testing of dairy herds from which whole milk is supplied to consumers in the City of Brisbane was fully realised, stated the Acting Minister for Agriculture, the Hon. A. Jones, in the course of a recent Press statement. With this end in view the Department is endeavouring to obtain assistance from practising veterinary surgeons. Already a number of highly qualified men have expressed their willingness to assist in this work and three additional veterinary surgeons from another State have made enquiries with regard to private practice in Queensland.

Correspondence Course in Pig Raising.

The Correspondence course of instruction in Pig Raising provided by the Department of Agriculture is a service much appreciated by farmers carrying on mixed farming and dairying in Queensland. During the past year there were 136 new applicants for enrolment from all over the State.

The course was instituted in 1932 and after 15 years of operation still has a popular appeal, not only to older farmers but also to women and junior farmers who are anxious to expand their knowledge and keep up to date with modern methods of pig production.

The course of 49 lessons is free to all interested persons. Application for enrolment should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane. The only expense involved is the cost of postage on returned examination papers.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

BUILDING UP HEALTH HABITS.

Rest and Sleep.

Last month we talked about the importance of the early establishment in toddlers of the right habits of exercise and play. Many parents do not realize that the habit of rest and sleep has equal importance in the life of the young child.

Sleep is nature's restorer. The body may starve for rest and sleep just as it may starve for food and many toddlers have far too little sleep. Children do not grow properly unless they have:—1. Enough sleep. 2. Regular sleep. 3. Sleep under the right conditions.

1. Enough Sleep.

Children from two to six years of age need *at least* 12 hours sleep each night and many do better with more than that. The child of early school age should have from 10 to 12 hours of sleep at night and a regular rest period during the day.

It is well for parents to know that an alert, energetic child does not store up enough energy even in a long night's sleep, to carry him through an active day. Therefore he must have a midday nap or rest of 2 hours if between the ages of two and four, at least 1 hour between the ages of four and six. Even if the child does not sleep, complete rest with relaxation will save his strength.

If he does not rest when he is tired his normal tiredness will soon become real fatigue and he will be cross and unhappy. A rest period before a meal helps both appetite and digestion.

2. Regular Sleep.

The child should go to sleep at the same time every day and night. When the habit of sleeping regularly is once formed the toddler will go to sleep quickly and naturally at his usual time.

3. Sleep under the Right Conditions.

A child should sleep in a bed by himself and whenever possible in a room apart from the adult members of the family. Sleeping on a veranda, provided the child is kept warm, is a great benefit to health. If sleeping in a room there should be a moving current of air between two open windows or a window and door, although the bed should be out of a direct draught in winter.

The bed should be comfortable and great attention should be paid to the mattress which should be straight and firm. A pillow is not necessary although a low one may be used if desired. Beds have a great effect on children's posture. Pyjamas and nightgowns should be loose and comfortable.

A child should go to bed happy and contented. The little trials and troubles of his daily life are just as real and important to him as those of grown-ups are to them. Therefore Mummy or Daddy should smooth them out for him before he goes to bed and pleasant thoughts should be put into his mind.

If his sleeping habits have been correctly managed from the start a child will regard going to bed as a normal part of his daily life and will not fuss or expect to be rocked to sleep or ask for toys or books to take to bed.

It is cruel to take little children out at nights and when father and mother wish to go out together they should arrange for a relation, friend or neighbour to be in the house with the sleeping children. There is a lot of room for the formation of friendly groups of women who will take turns in helping each other in this way and so ensure that children are not deprived of their sleep which is of such great importance to good development and stable nervous system.

Any advice on children's bedding or night clothing or other matters connected with sleeping may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

Fruit Cake.

Eight ounces self-raising flour, 3 oz. sugar, 3 oz. butter, 1 oz. candied peel, 6 oz. sultanas and currants, pinch of salt, 1 egg, ¼ pint milk. Sieve the flour and salt and rub in the fat. Add the sugar, prepared fruit and shredded peel. Mix with the egg and milk. Put into a greased and floured 7-inch cake tin and bake in a moderate oven for about two hours.

Cheese Canapes.

Half a teacup thin parsley sauce, ½ teaspoon dry mustard, 2 teacups grated cheese, 4 slices hot toast canapes. Pour sauce into the top of a double saucepan. Add mustard and cheese. Cook over boiling water, stirring constantly until cheese melts and the mixture is smooth. Divide equally between untoasted sides of canapes. Enough for four persons.

Fruit Trifle.

A sponge sandwich or remains of a stale plain cake, 1 pint of custard, 1 lb. of any fruit in season, a little jam, a gill of milk. Cut up the cake and spread half with jam, then arrange in a glass bowl. Pour a little hot milk over to soak cake. Put in a layer of fruit. Cover with rest of the cake and again pour in a little hot milk. Make custard and pour over whilst hot, but not boiling. Leave to get cold, then decorate with fruit.

Marrow and Tomato Savoury.

Half a pound of tomatoes (sliced), 1 medium onion (sliced) ½ oz. dripping, 1½ to 2 lb. vegetable marrow, salt and pepper, a pinch of mixed herbs, ½ teaspoon sugar, ½ pint of hot water, chopped parsley. Fry the tomatoes and onion in the dripping for five minutes. Prepare the marrow and cut into small pieces. Add to the tomato and onion with the herbs, sugar and hot water, season to taste. Cover and boil gently for 30 minutes, or until the marrow is tender. Turn on to a hot dish and serve, sprinkled with chopped parsley.

Cucumber Boats.

One cucumber, a bunch of watercress, or a lettuce, a few radishes, a few spring onions or chives, a small tin of sardines or pilchards (if procurable). Wipe cucumber with a damp cloth, then split down lengthwise. Cut into 3 in. pieces, scoop out pith. Chop up the fish and onions or chives, mix well and season with black pepper. Chop up watercress or lettuce rather finely and spread over a large flat dish. Fill each piece of cucumber with the fish and onion mixture and add a dash of salad dressing. Set the boats on the sea of greenstuff, arrange a border of radishes, cut in halves and serve.

QUEENSLAND WEATHER IN DECEMBER.

Mainly good distribution of rain over the State during the month resulted in 46 per cent. above normal totals in South Coast Moreton, averaging 7½ inches with many over 10-inch totals registered, highest being 1,503 at Springbrook, 1,416 Murgon, 1,270 Nanango, and 1,259 Harrisville. Falls were 82 per cent. to 85 per cent. above normal on the Darling Downs, averaging 5 to 6½ inches, highest individual total being 1,029 points at Leyburn. Peninsula South, Central Highlands and Lowlands, South Coast Port Curtis, and Far South-west ranged from 0 to 24 per cent. above normal. Other divisions were below normal—Carpentaria, Peninsula North, and Warrego 11 per cent. to 29 per cent. below, Western districts 35 per cent. to 41 per cent. below, and Central and North Coast receiving the least benefit, being 53 per cent. to 62 per cent. below normal. Heaviest 24-hour fall for the month was 415 points at Morningside on 10th.

With the cumulative benefits of spring and December rains the general pastoral position over the greater part of the State should be the most favourable for this time of the year. General farming conditions in all districts are also above average, but the persistent rains over the wheat areas during the first half of the month proved a set-back to the unharvested 20 per cent. of the estimated 11,000,000-bushel record wheat yield. Apart from local rain and storm damage, water-logged ground prevented harvesting in several districts. Some damage was also reported in the Granite Belt fruit areas, but the dairying production output received considerable impetus.

Storm Damage.—Thunderstorms with local hail were very prevalent, especially in the south-eastern quarter. There were some local strong blows and isolated examples of tornadic activity. St. George suffered damage on the 19th, and on the 7th Rockhampton and Beaudesert reported hail as large as cricket balls. At Rockhampton there was a 70 m.p.h. wind gust.

Flooding.—With the persistent rains in the south-eastern quarter during the first half of the month all streams commenced to carry a considerable run-off and flooding of low-lying areas was fairly extensive. Main streams affected or reaching flood height reporting stage included Balonne, Condamine, Macintyre, Brisbane (Murrumba, Brisbane River watershed), Dawson, and parts of the Upper Mackenzie.

Temperatures.—Excepting in the Peninsula and western divisions, where temperatures were slightly above normal, it was a cool month for the State with maximum minimum temperatures chiefly .5 deg. to 1 deg. below normal, but 2 to 3 deg. below normal in the Maranoa and south-west districts. Winton, Cloncurry, and Camooweal had 22, 21, and 20 days respectively in the month when maximum temperature reached the 100 deg. mark, but most inland stations had less than 10 days. Highest maximum was 111deg. at Urandangie on 14th.

Brisbane.—Mean pressure $\frac{9+3}{2}$ 29.879 inches (normal 29.888 inches).

Temperatures.—Mean maximum 82.6 deg. (normal 84.7 deg.) ; highest 92.6 deg. on 22nd.
Mean minimum 67.0 deg. (normal 67.5 deg.) ; lowest 62.1 deg. on 10th.
Mean temperature 74.8 deg. (normal 76.1 deg.).

Rainfall.—814 points on 18 days (normal 506 points on 12 days). Highest December rain since 1,523 points in 1943. Highest number of rain days since 1942 (20 days).

Rain position is summarised below.

Division.	Normal Mean.	Mean December, 1947.	Departure from Normal.
	Points.	Points.	Per. Cent.
Peninsula North	702	525	25 below
Peninsula South	605	619	2 above
Lower Carpentaria	392	289	26 below
Upper Carpentaria	377	335	11 ,,
North Coast, Barron	690	327	53 ,,
North Coast, Herbert	690	263	62 ,,
Central Coast, East	454	207	54 ,,
Central Coast, West	333	128	62 ,,
Central Highlands	316	393	24 above
Central Lowlands	221	221	..
Upper Western	184	109	41 below
Lower Western	137	89	35 ,,
South Coast, Port Curtis	455	504	11 above
South Coast, Moreton	509	745	46 ,,
Darling Downs, East	351	648	85 ,,
Darling Downs, West	277	503	82 ,,
Maranoa	258	463	79 ,,
Warrego	215	152	29 below
Far South-West	155	175	13 above

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

FEBRUARY.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.21	6.42	Cairns	41	17	Longreach	40	30
6	5.24	6.40	Charleville	29	25	Quilpie	34	36
11	5.28	6.36	Cloncurry	57	42	Rockhampton	15	5
16	5.32	6.32	Cunnamulla	28	30	Roma	18	16
21	5.35	6.28	Dirranbandi	18	20	Townsville	34	16
26	5.38	6.23	Emerald	24	14	Winton	46	34
29	5.40	6.21	Hughenden	42	27	Warwick	3	5

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	p.m.	a.m.
1	10.56	11.19
		p.m.
2	11.30	12.19
3	..	1.18
	a.m.	
4	12.08	2.16
5	12.50	3.13
6	1.36	4.07
7	2.26	4.57
8	3.19	5.42
9	4.14	6.23
10	5.09	6.59
11	6.04	7.32
12	6.58	8.02
13	7.50	8.31
14	8.44	8.59
15	9.37	9.29
16	10.32	10.00
17	11.30	10.36
	p.m.	
18	12.32	11.18
19	1.36	..
		a.m.
20	2.42	12.06
21	3.46	1.04
22	4.45	2.09
23	5.38	3.20
24	6.24	4.33
25	7.05	5.44
26	7.42	6.53
27	8.17	7.59
28	8.52	9.03
29	9.27	10.05

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	24	15	40	31	15	6	46	35
6	30	9	45	24	20	0	53	26
11	25	14	42	29	17	4	49	33
16	15	24	30	40	6	15	35	46
21	9	30	25	45	0	21	26	53
26	18	22	34	38	9	13	38	43
29	25	14	42	30	16	5	48	34

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	40	20	57	44	42	29	33	18
3	50	10	64	37	48	23	41	10
5	58	4	67	33	50	19	44	5
7	55	3	68	32	51	18	45	4
9	52	8	66	36	50	21	43	8
11	44	16	61	41	45	26	37	15
13	34	26	54	47	38	33	29	22
15	25	36	47	55	32	40	21	31
17	15	45	40	60	25	46	14	37
19	6	53	35	66	20	51	6	44
21	3	55	34	67	18	52	4	45
23	10	51	37	64	22	50	9	43
25	20	40	44	58	29	43	18	34
27	33	28	52	49	37	34	27	24
29	43	17	60	42	45	27	36	16

Phases of the Moon.—Last Quarter, February 2nd, 10.31 a.m.; New Moon, February 10th, 1.02 p.m.; First Quarter, February 18th, 11.55 a.m.; Full Moon, February 25th, 3.16 a.m.

On February 15th the Sun will rise and set, respectively, 15 degrees South of true East and true West, and on the 14th and 26th the Moon will rise and set at true East and true West.

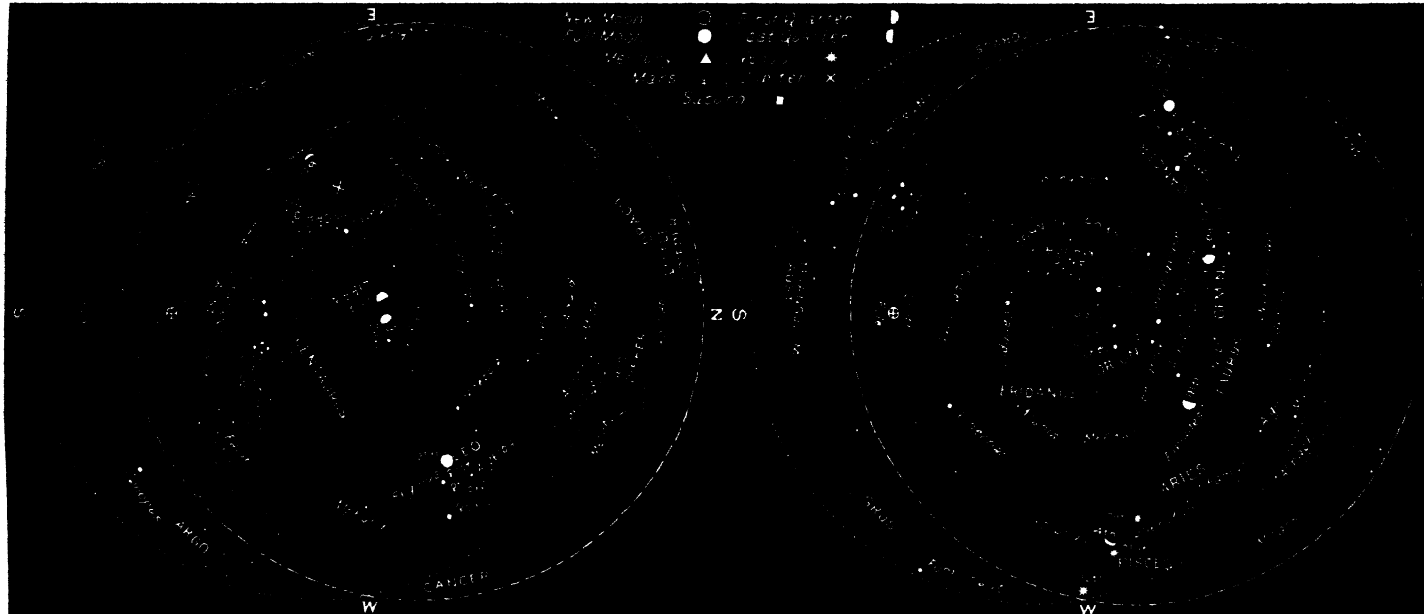
Mercury.—Will remain in Aquarius all this month. On the 1st it will set 1 hour after the Sun and will reach greatest angle East of the Sun on the 4th. On the 20th it will be at inferior conjunction, and by the end of the month will rise 1¼ hours before Sunrise.

Venus.—In the constellation of Pisces, will set nearly 2 hours after the Sun during this month.

Mars.—At the beginning of the month in the constellation of Leo, will rise between 8 p.m. and 9.15 p.m. On the 18th it will pass to the North of Regulus and will be in opposition to the Sun on this date. At the end of the month Mars will rise between 5.30 p.m. and 7 p.m.

Jupiter.—Now a morning object. On the 1st, in the constellation of Ophiuchus will rise between 1.30 a.m. and 2.45 a.m., and at the end of February, in the constellation of Sagittarius, will rise about midnight.

Saturn.—In the constellation of Leo, will be in opposition to the Sun on the 9th. On the 1st it will rise 1 hour before Mars and by the end of the month will rise ½ hour before that planet. Saturn will then lie southward of Mars and be the fainter of the two.



Star Charts.—The chart on the right is for 8 15 p m , in the South-East corner of Queensland, to 9 15 p m. along the Northern Territory border on the 15th February (for every degree of longitude we go west the time increases 4 minutes). The chart on the left is for 8 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the N.S.W. border. When facing North hold "N" at the bottom; when facing South hold "S" at the bottom; and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th and at the end of the month about one hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

DECEMBER RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.,	No. of years' records.	Dec., 1946.	Dec., 1947.
North Coast.	In.		In.	In.
Atherton	7·02	42	2·02	3·80
Cairns	8·53	61	2·27	1·55
Cardwell	7·95	71	1·12	6·89
Cooktown	6·53	67	4·64	4·35
Herberton	5·64	57	2·50	3·92
Ingham	6·77	51	1·66	1·12
Innisfail	11·16	62	4·86	2·61
Mossman	8·00	19	4·88	3·21
Townsville	5·33	72	1·21	1·33
Central Coast.				
Ayr	4·20	56	1·95	2·37
Bowen	4·49	72	1·40	1·16
Charters Towers	3·25	61	2·08	1·89
Mackay	6·86	72	1·17	2·96
Proserpine	7·72	40	1.15	1·37
St. Lawrence	4·67	72	2·11	2·13
Central Highlands.				
Clermont	3·77	47	2·67	8·07
Springsure	3·28	74	2·53	7·00
South Coast.				
Biggenden	4·85	44	2·84	1·64
Bundaberg	5·10	60	1·44	8·07
Brisbane Bureau	4·95	95	6·11	8·14
South Coast—contd.				
Caboolture	5·48	67	2·94	6·63
Childers	5·80	48	4·50	4·28
Crohamhurst	7·19	50	3·00	7·07
Esk	4·76	56	2·80	11·77
Gatton College	3·89	44	2·81	9·70
Gayndah	4·21	72	4·06	5·17
Gympie	5·40	73	2·05	6·06
Kilkivan	4·61	62	3·00	7·12
Maryborough	5·05	72	2·21	3·93
Nambour	6·65	47	3·51	6·61
Nanango	3·86	61	2·27	12·70
Rockhampton	4·67	72	2·37	4·43
Woodford	5·34	56	2·44	8·64
Darling Downs.				
Dalby	3·49	73	1·82	6·98
Emu Vale	3·52	47	2·98	7·73
Jimbour	3·44	64	2·00	3·39
Miles	3·17	58	2·33	6·82
Stanthorpe	3·56	70	4·00	6·00
Toowoomba	4·53	71	2·65	7·83
Warwick	3·50	78	4·97	7·05
Maranoa.				
Roma	2·59	69	1·26	4.33
St. George	2·09	62	2·31	3·80

CLIMATOLOGICAL DATA FOR DECEMBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	89	73	92	29, 31	70	7, 8, 21	155	12
Herberton	..	84	63	92	23	57	11	392	13
Townsville	..	88	75	96	26	67	9	133	4
Rockhampton	29·87	89	69	98	22	62	8, 15	443	9
Brisbane	29·91	83	67	93	22	62	10	814	18
Darling Downs.									
Dalby	..	85	63	94	22, 23	56	5	698	15
Stanthorpe	..	79	57	90	23	46	5	600	15
Toowoomba	..	80	59	90	23, 24	50	5	783	18
Mid-Interior.									
Georgetown	29·83	95	73	100	23, 26	67	11	378	8
Longreach	29·83	99	71	108	28	61	4	75	4
Mitchell	29·85	89	63	102	23	51	27	274	8
Western.									
Burketown	..	96	75	100	22, 23	65	4	112	5
Boulia	29·77	101	78	114	20	59	3, 4	20	1
Thargomindah	29·78	92	68	102	19, 20 29, 30	58	4	192	4

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

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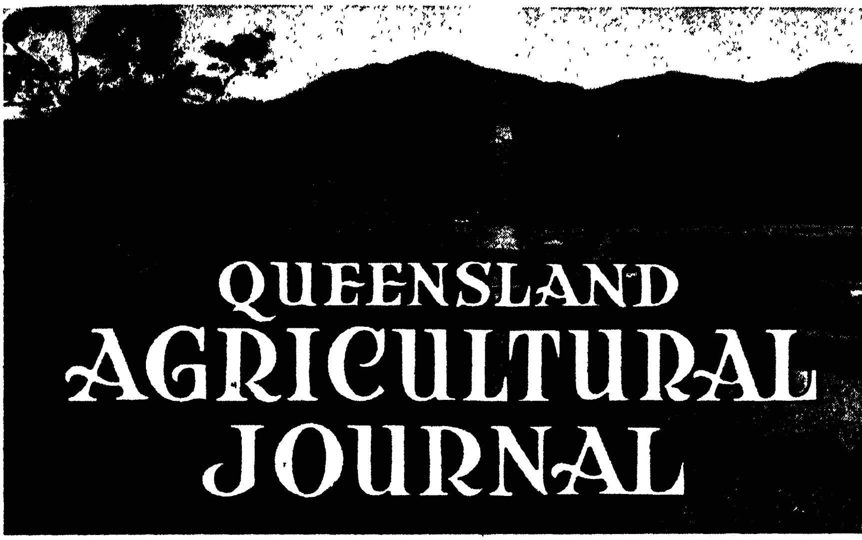
3

Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Art, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**



Volume 66 | 1 FEBRUARY, 1948 | Part 2

Event and Comment.

Unit Herd Testing Scheme.

The Minister for Agriculture and Stock (Hon. H. H. Collins) in a recent statement expressed his pleasure that the Unit Herd Testing Scheme initiated by the Department at Beaudesert in January had got off to a good start and that farmers whose herds are being tested under the scheme were well satisfied with the service.

It is intended that the herd recorder visit each farm monthly for the purpose of weighing, sampling and testing the milk from each cow. The farmer provides accommodation for the recorder whilst he is testing at the farm. When testing is finished, the recorder computes the milk and butterfat production of each cow and hands the results to the farmer.

The cost of operating the units is borne jointly by the farmer, the State Government and the Commonwealth Government. The Commonwealth Government has limited its contribution to an amount of £20,000 per year for the whole of Australia. The cost above the Commonwealth allocation is divided equally between the farmer and the State Government. The cost to the farmer in a unit averaging 800 or more cows per month is 4½d. per cow per test, plus a levy of one halfpenny to defray half the cost of the equipment. The levy will cease when half the cost of the equipment has been met.

The recorder's equipment includes scales, testing machine, milk-testing flasks, sample bottles, acid, and milking-machine test buckets.

The provision of the buckets allows big machine-milked herds to be tested without having to revert to hand milking. Experience gained at Beaudesert shows that the first milking with the buckets is somewhat slower than usual, but the next milking is completed as fast as usual.

The information gained by a monthly test will prove a valuable guide to the members of the units, particularly those who hand feed during portion of the year, and will also provide the information required when culling a herd.

When the scheme is well established it is proposed to institute sire surveys, and thus provide the dairymen with information regarding the ability of herd sires to transmit production to their heifers.

Groups of farmers interested in forming units should communicate with the Department of Agriculture and Stock, and if desired the Senior Adviser (Herd Testing) will attend a meeting of those interested and explain the workings of the units in detail. Although it is late in the season now, intending units should organize with a view to commencing operations in the spring. Prior notice is desired by the Department so that arrangements can be made to obtain the necessary equipment, which is difficult to procure.

Encouraging Veterinary Services.

An ambitious scheme announced recently by the Minister for Agriculture and Stock, should, when fully implemented, meet a long-felt want and prove of far-reaching benefit to stock owners in country centres particularly and the animal industry generally. In announcing the scheme, Mr. Collins said that the Government's proposal was to encourage highly qualified veterinarians to set up in practice in country districts in this State and thus provide stock owners with easy access to veterinary services for attention to the many problems associated with the animal industry. As an incentive to set up in practice, it is proposed to offer these men tuberculin testing work on behalf of the Department, in country districts, to provide them with a means of livelihood whilst establishing a practice in such areas. The first area to be dealt with embraces the country districts surrounding the Greater Brisbane area. At the end of January two veterinarians had indicated that they would avail themselves of the Government's offer, whilst at least two others were expected to agree to the proposal at an early date. As more men become available the scheme will be extended to other areas. With encouragement and assistance from the stock owners, their associations, and co-operative bodies, the plan should prove of inestimable value to the State in due course.

In the meantime, the staff of the Division of Animal Industry of the Department will continue to deal with the control of contagious and infectious diseases, investigations of outbreaks of disease, particularly where large numbers of stock are concerned, and by extension work teach stock owners the value of modern methods of disease control and of animal husbandry generally.

Activities of the Bureau of Tropical Agriculture.

T. G. GRAHAM, Officer in Charge.

THE Bureau of Tropical Agriculture (Plates 18 and 19), which is situated opposite the township of South Johnstone and some seven miles distant from Innisfail, came into being towards the close of 1935. The Station was taken over from the Sugar Bureau, which was vacating the 92 acres of reserve on the South Johnstone River to establish a similar station a little further north on land which was more typical of the bulk of sugar land which their Station was intended to serve. The purpose of transferring this small reserve from the Sugar Bureau to the Agriculture Branch was to enable the latter to investigate the possibilities of crops other than sugar cane in this wet tropical area.

A Director of Tropical Agriculture was appointed to organise the Bureau and set about the establishment of trial areas of tropical crops. Many crops were tried, and it was found that, while most of them grew satisfactorily, the economics of their production did not justify further studies on their agricultural aspects. There were, however, a few crops which, while they did not measure up economically under existing cultural methods employed in their production, had distinct possibilities if the mechanization of harvesting could be applied to them. A strong feeling exists in the minds of a few Queensland agriculturalists that tea and derris come in this category and consequently these two tropical crops have been subjected to further studies at the Bureau.

EARLY PASTURE WORK.

At about the time that this early work was in progress, a northern pioneer in the person of the late Mr. Brice Henry conceived the idea of utilizing the wet coastal belt as a vast fattening ground for cattle from the drier western areas. Experiments were conducted on Mr. Henry's property by the Bureau in conjunction with the Animal Health Station at Oonoonba, and it was quite clearly shown that two-year-old stores could be topped off on coastal pastures within eight months, thus bringing them to maturity at least a year earlier than would have been the case if they were allowed to fatten where they were bred. In addition, stock could be maintained in a fat condition long after the western cattle had commenced to decline and in this manner assist in the extension of the killing period. This work was carried out for the most part with Para grass*, the property in question being ideally suited to this species.

* *Brachiaria purpurascens* Raddi.

Plate 18.

BUREAU OF TROPICAL AGRICULTURE, SOUTH JOHNSTONE.—General view of buildings.

Prior to the impetus given to fat cattle-raising on the coast by Mr. Henry, a small tract of country on the Daintree River had been opened up for dairying. A little later, some country towards the Coastal Range between Innisfail and the Atherton Tableland was established to pastures, and dairying became the occupation of selectors in the area. Factories were established on the Daintree and at Silkwood to handle the produce from these two areas. The principal pasture species used was molasses grass†. Due to annual fires, overstocking, and a fact not known at that time and little appreciated even to-day (namely, that molasses grass will not stand continuous grazing), the pastures deteriorated. The result was that the carrying capacity fell off and

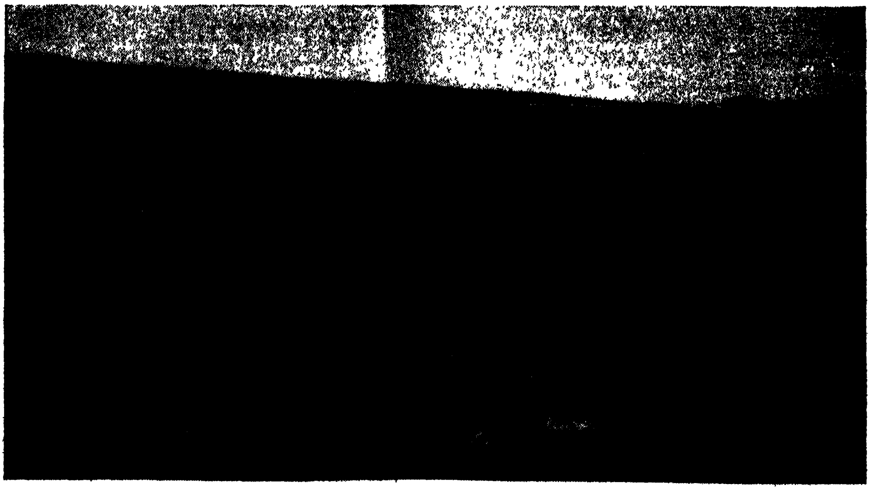


Plate 19.

BUREAU OF TROPICAL AGRICULTURE, SOUTH JOHNSTONE.—View showing stockyards, orchard and pasture areas. Buildings in middle of photograph.

† *Melinis minutiflora* Beauv.

troublesome weeds and inferior grasses threatened to push the farmers out of production. There was also a decline in fertility level because of the absence of a suitable legume, and, in its absence, the failure to apply nitrogen by artificial means.

Early in the Bureau's activities, an attempt was made to determine what leguminous species could be grown in this high rainfall area, in which the soils are extremely acid. By 1939, it had been established that, out of over 200 species tried—many of which were from temperate zones—five legumes were outstanding, namely, puero*, centro†, calopo‡, stylo§, and Sarawak bean||. During the war years, the activities of the Station were largely confined to experiments in connection with the war effort, and unfortunately all other activities had to be curtailed. It was not until 1944 that an attempt was made to sort out the results of the important preliminary work, but steadily the fitting of this early work into some form of agricultural programme began to take shape.

Plate 20.

SHOWING GATES AND FENCES ENCLOSING EXPERIMENTAL AREAS.

While it had been shown that the legumes mentioned grew extremely well on the coast, little was known of their palatability. Moreover, conflicting opinions existed amongst farmers on whose properties small exploratory plots of these legumes had been established.

It had been fairly clearly demonstrated that the future development of this wet coastal belt lay along the lines of animal husbandry. Moreover, it was felt that, if these legumes proved desirable pasture species, the practical application of the knowledge gained could, in some measure, arrest the declining fertility of the cane land as well as the poorly managed pasture areas. With such a weight of evidence and public opinion directed towards this aspect, the Bureau began to change over to pasture investigations, which are described in this article.

* *Pueraria phaseoloides* Benth.
† *Centrosema pubescens* Benth.
‡ *Calopogonium mucunoides* Desv.
§ *Stylosanthes gracilis.*
|| *Dolichos hosei* Craib.

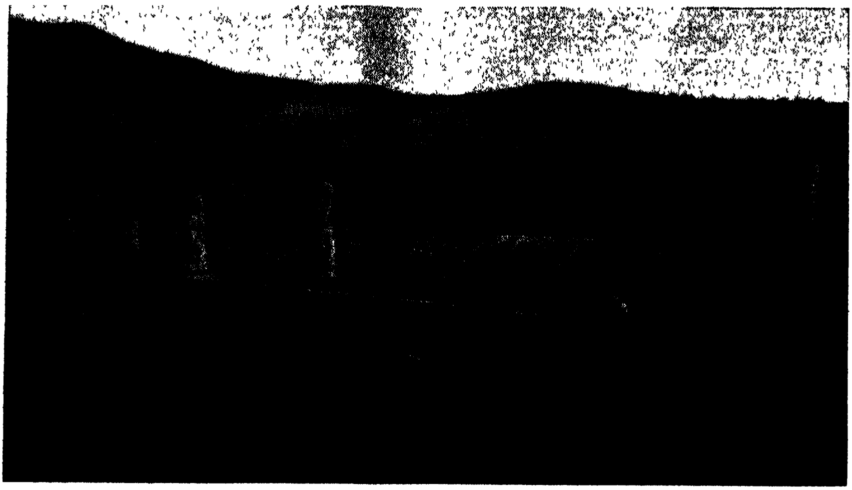


Plate 21.
WATER TROUGH FOR STOCK IN LANEWAY.

TRANSITIONAL PROGRAMME.

The changeover from crop investigations to pasture investigations took considerable time. It entailed a completely new design in layout accompanied by the provision of permanent fixtures such as fencing, yards, shade and shelter, water, and so on (see Plates 20 and 21). In the new programme, certain experimental areas had to be retained in their existing form, which further complicated the layout plan. A design was ultimately arrived at, and an area of two acres selected as a unit for pasture work. All the grass-legume combinations have thus been established in two-acre blocks and each is grazed in rotation.

Plate 22.
CATTLE MOVING THROUGH LANEWAYS TO WATER.

Rather than provide water and shelter in each block, it was decided to erect a laneway linking all blocks with water and shade. The animals could then wander at will between the paddock that was opened for grazing and the other facilities necessary for their husbandry (see Plate 22). This has proved a most desirable arrangement, for the cattle of their own accord visit the paddock for grazing only and spell under the shade of the farm woodlot (Plate 23); in this way the wastage that takes place in pastures as the result of trampling and camping is avoided. It is also the nearest approach to grazing under natural conditions, where stock leave the grazing areas for water and shelter in the shade along the banks of streams.

Plate 23.
STOCK SHELTERING IN WOODLOT.

The farm had a deteriorated woodlot which had to be thickened. As this was the only shade for stock, only half of it could be planted to trees at one time. Accordingly, one section was fenced off and planted, and some 600 trees of various species are now in their third year of establishment. When these have matured sufficiently to be resistant to damage by stock, the areas will be changed over and further plantings will take place.

The construction of a stockyard had to provide for drafting pen, dehorning and branding race, general race for spraying and measuring, weighbridge, and holding yard. The races were fitted with quick-operating slide gates, while easy-moving swing gates were fitted to the enclosures.

PASTURE DEVELOPMENT.

Plant Introduction.

Plant introduction plays an important part in the pasture programme. An area of the farm has been set aside for this aspect of the work. Any promising species from the introduction plots are placed out into larger legumes or grass seed-increase plots from which more than sufficient seed can be obtained to plant a unit area of two acres.

Palatability Trial.

A palatability trial, consisting of six legumes replicated three times in $\frac{1}{10}$ acre blocks (Plate 24) was commenced in 1945. The legumes are puero, centro, calopo, stylo, Sarawak bean and *Desmodium heterophyllum.* Stock were introduced into the pastures in 1946, and since September of that year the palatability trial has been regularly grazed. Some very interesting information regarding the behaviour of these legumes under stocking, and the stock preference for them, has been obtained. The general procedure has been to take detailed notes of these legumes and determine yield by quadrat sampling before grazing, make observations during grazing, and take detailed notes after grazing. The determination of beast hours during grazing is likely to be misleading if analysed without reference to the other information, for in this locality during summer stock tend to remain under the shade of trees during the heat of the day and do not come out to graze until about 4 p.m. They graze

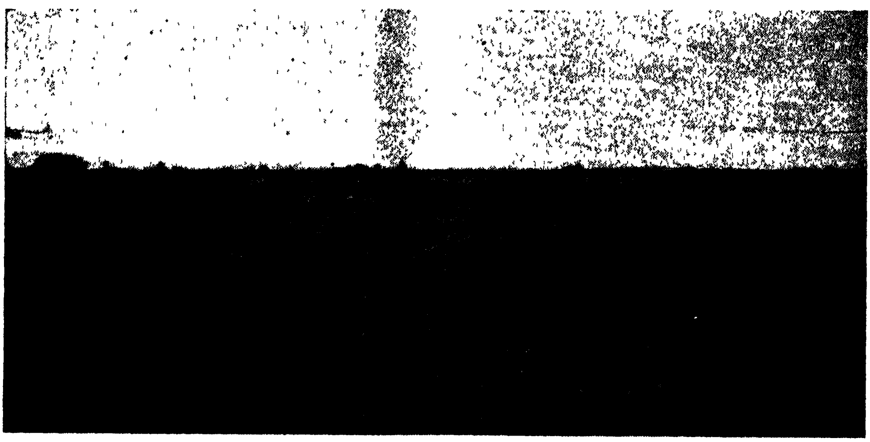


Plate 24.

VIEW OF PALATABILITY TRIAL BLOCK.

during the night and seek shade again about 9 a.m. The number of hours, therefore, during which one can observe grazing comprises only a very short period of the actual grazing hours. The observations are important in determining which species are eaten first and stock preference or otherwise for the various legumes.

The latter end of 1946 was extremely dry, so much so that every dairy farmer felt the strain of lack of fodder. At the Bureau, on the other hand, cattle which were purchased in poor condition continued to put on weight and develop attractive coats all through this period. This success was undoubtedly due to the legumes, particularly in this special instance to centro. Centro showed a remarkable adaptability to dry conditions and remained green and continued to grow after all the other legumes had begun to shed their leaves. It was the legume most favoured by stock in the palatability trial for the first two grazings. In February, when all the plots had made a remarkable recovery owing to bounteous rains, puero was taken in preference to all the other legumes, while Sarawak bean and Desmodium were also relished. Stylo was

Plate 25.

LOOKING THROUGH BRUSHED SCRUB AREA AT UTCHEE CREEK.

practically neglected during this grazing, but in May, when the area was opened to stock for the fourth time, the stock grazed stylo to the ground in all three plots before attempting to graze any of the other legumes.

Calopo has been disappointing in this trial. It grows vigorously and forms a dense cover, but unfortunately it is not sought after by stock. Only light grazing has been observed on the calopo plots at any time.

A chance combination of grass and legume seems to have made its appearance in one of the Desmodium blocks. This block is separated by a 40-links laneway from a plot of fallow panic grass,* which set a heavy

Plate 26.

BURNT SCRUB AT UTCHEE CREEK, THREE MONTHS AFTER FELLING.

* *Brachiaria miliiformis* Chase.

crop of seed last season and as a consequence was able to invade the Desmodium block while the latter was still recovering from the extremely dry spring of the previous year. Fallow panic was introduced into North Queensland many years ago, but it is only within the last five years that it has come under general notice. In that time it has spread rapidly and the writer, noticing how cattle took to the grass and being attracted by its habit of growth, established a seed-increase block at the Station. At the present time, the grass and Desmodium are growing in an excellent combination. Further studies are planned to observe the behaviour of what promises to be quite an interesting association.

Plate 27.

CENTRO AND PURPLE-TOPPED GUINEA GRASS MIXTURE RECOVERING FROM GRAZING.

Sarawak bean presents some difficulty in establishment. The seed is developed in small pods on the underneath side of the plant and consequently is difficult to harvest. The plots in this trial were established by vegetative means and, running into dry weather following planting, had rather a poor time. For the first eight months it seemed that weeds had the upper hand but eventually an almost complete cover of legume developed over the three plots. Sarawak bean appears to stand up to stocking extremely well.

Grass-Legume Mixtures.

Unit areas of two acres were established and planted to grass-legume combinations. Three grasses had given outstanding results at the Station during the time the legumes were being developed. These were: Para, Guinea*, and molasses grasses. It was decided, therefore, that they should form the basis of the pasture development work and that some of the legumes should be tried in combination with them.

* Varieties of *Panicum maximum* Jacq.

Accordingly, the following mixtures were laid down:—

Centro and Purple-topped Guinea grass*	2
Stylo and Common Guinea grass†	2
Calopo and Molasses grass	2
Puero and Molasses grass	2

These combinations have been subjected to grazing since late in 1946. While the pasture work was in its early stages, eight two-year-old Hereford steers were used for grazing, but since the total area has been planted to pastures the herd has been increasd to 16. The paddocks are grazed with the whole herd for a period of 5 days and spelled for 35 days. This is a tentative arrangement which may have to be altered as experience indicates. At the end of each 5-day period the cattle are weighed. The object is to observe the behaviour of both grasses and legumes under stocking, the degree of grazing necessary to maintain a desirable grass-legume combination, and the differences in carrying capacity of the various mixtures.

Plate 28.

STYLO AND COMMON GUINEA GRASS MIXTURE.

The aim of this work is to obtain pointers to enable experimental work to proceed on a larger scale when sufficient information has been accumulated. For the extended work a property of some hundreds of acres of virgin scrubland (Plates 25 and 26), situated on Utchee Creek ten miles to the south-west of the Station, has been acquired. It is felt that the behaviour of purple-topped Guinea grass + centro (Plate 27), and of common Guinea grass + stylo (Plate 28) is so favourable as to warrant large-scale experimental investigation at the earliest date. Guinea grass

* *Panicum maximum* var. *coloratum*.

† *Panicum maximum* var. *typica*.

and centro both stood up extremely well to the dry conditions experienced towards the end of 1946. They grow remarkably well under the extremely wet summer conditions encountered in this area. They will stand extremely heavy grazing and so far appear to combine quite well as pasture mixtures. Centro was the outstanding legume in the palatability trial. It remained green and produced a large bulk of feed when all the other legumes had lost their leaves and were drying off. Stock put on weight and retained quite a shine on their coats even though the bulk of the pasture was coarse, dry grass. Centro and Guinea grass have been grown in combination at the Bureau for the last six years.

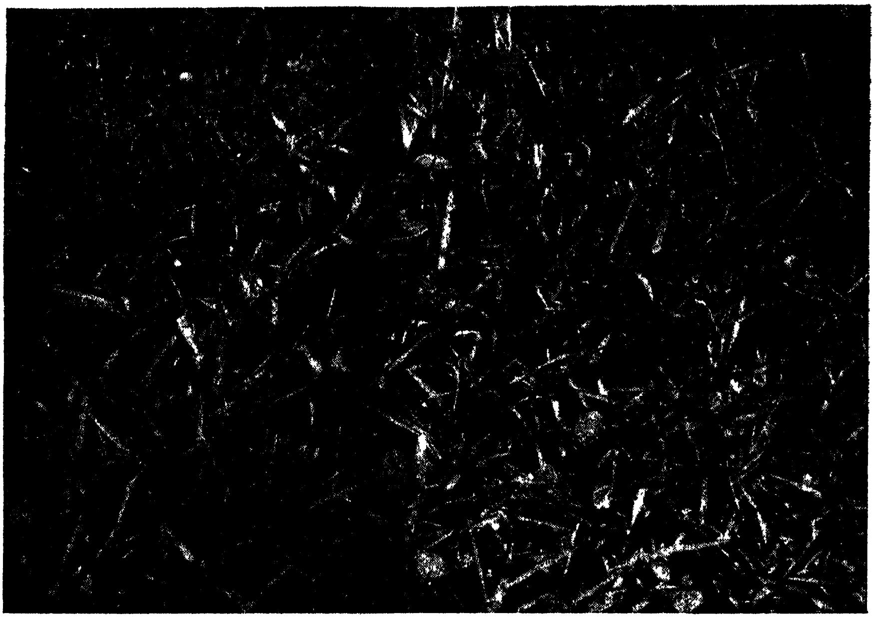


Plate 29.

CALOPO AND MOLASSES GRASS MIXTURE.

Stylo and Guinea grass also grow well together provided the Guinea grass is well managed. Stylo, unlike centro, is not a twining species, and, if the Guinea grass is allowed to grow too tall, the slower-growing stylo is apt to become smothered. It was handled quite satisfactorily, however, in a stand of Guinea grass at the Bureau through the wet months of February and March, 1947. Both grass and legume will stand heavy stocking, they both regenerate well, and they give good results under dry and wet conditions alike.

Apart from the experimental work planned for Utchee Creek and the work with grass and legume mixtures at the Bureau, an area of river flat country on the lower end of the Station has been cleared of sucker growth and allowed to regenerate under Para grass. Scattered patches of Para grass have persisted on this river flat area ever since the days when cane was last grown on the area. As the result of fencing and locking up these paddocks, a reasonably good stand of Para grass has developed and the time has arrived when an effort could be made to establish puero, centro, and stylo in this stand.

Puero and molasses grass have so far given good results in combination, but it is doubtful whether puero will stand up to the heavy rotational grazing necessary to keep the molasses grass in young growth.

Calopo and molasses grass are also growing in association with each other (Plate 29), but there appears to be a very delicate balance, and if this is disturbed one or the other species is inclined to dominate the pasture with the balance in favour of the legume. Guinea grass, on the other hand, seems to be able to resist the spread of calopo (Plate 30). It seems that calopo is grazed slightly better where it forms a constituent part of a pasture. In spite of this observation, one is reluctant at this stage to recommend it for general planting in a pasture mixture.

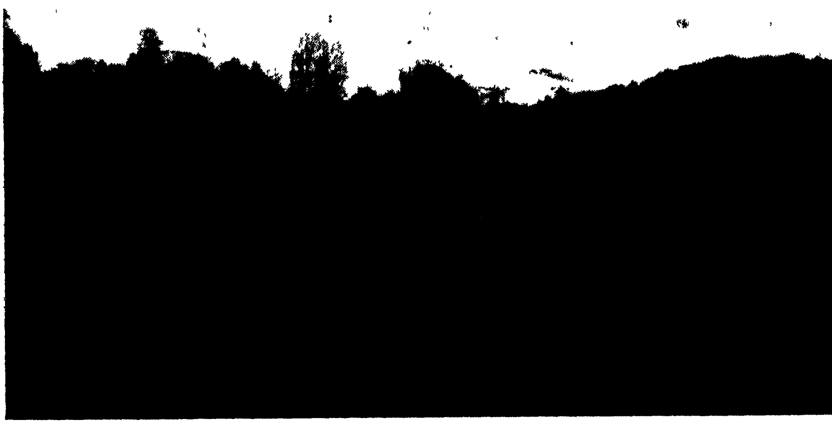


Plate 30.

GUINEA GRASS AND CALOPO AT UTCHEE CREEK.

Some Promising Species.

Since the establishment of the work already outlined several promising grasses and legumes have made their appearance. Notes on these are given hereunder.

Scrobic.*

This species, procured from the Council for Scientific and Industrial Research, has been established readily from seed and has made good growth at the Station under both wet and dry conditions. The behaviour of this grass on the wet tropical coast will be watched with interest since it would appear that some of our semi-decumbent types of legume have a better chance of developing in association with this grass than with some of our more vigorous species.

Fallow Panic.

Brief mention has already been made of this species, which was introduced to North Queensland some years ago and which within recent times has spread naturally throughout the north coast. A plot has been established at the Station to observe its behaviour under grazing and to determine its value in association with various legumes, notably *Desmodium heterophyllum*.

* *Paspalum scrobiculatum* L.

Desmodium canum.

This is a recent introduction from Hawaii. Seed for the original plot was obtained from the Commonwealth Vegetable Farm at Home Hill but further plantings have been made from seed sent direct from Honolulu.

It germinates readily from seed, but seems very slow to become established at the Bureau. It is an attractive looking legume, and efforts are being made to establish it with several of the more decumbent grass species. From a small plot established last year the natural regeneration gives promise and its spread is watched with great interest.

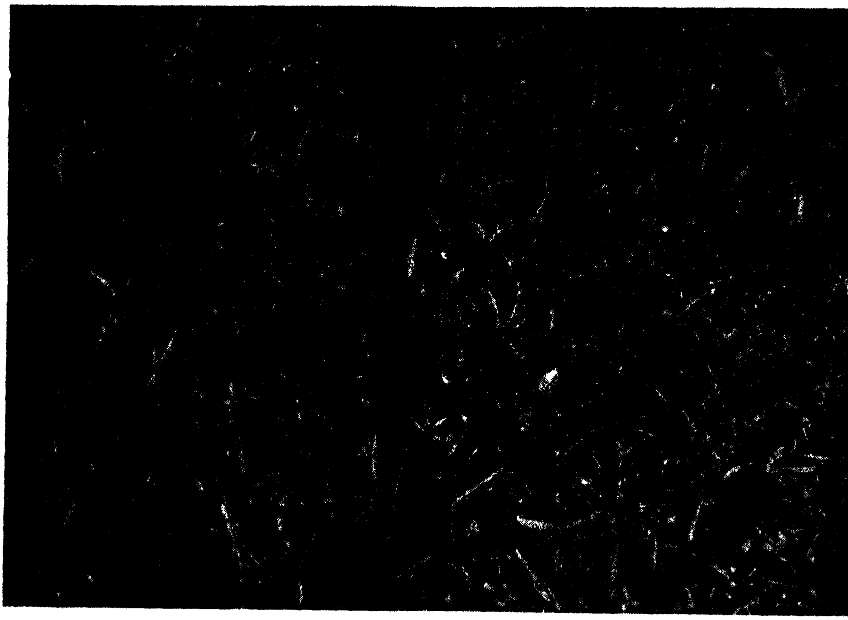


Plate 31.
CENTRO AND MOLASSES GRASS MIXTURE.

Samoan Clover.*

So far, we have not succeeded in properly establishing this legume with a grass, but there is evidence of invasion on the adjoining plots of legumes. It seeds well and the minute hairs around the seed coat give it a ready means of dissemination, since it clings to the hairs of animals.

Common Lespedeza.†

This species of lespedeza was tried in 1946 but did not look at all promising. However, the small plants seeded and a young crop came away in the spring of 1947. Being a summer annual, it might be better suited to a slightly drier area where the seed would germinate with the summer rains.

* *Desmodium scorpiurus.*
† *Lespedeza striata* Hook. et Arn.

Kudzu.*

This famed plant has been growing at the Station for the last ten years. Two years ago it was established in a plot and has made good growth (Plate 32). Unfortunately, it loses its leaves and becomes dormant in the winter, and, by comparison, is vastly inferior to puero in this locality. Its feature lies in the fact that it can be grown in much colder latitudes than puero and, like the latter, is an excellent plant for the control of erosion in broken gullies, &c.

Plate 32.
PORTION OF A KUDZU STAND AT SOUTH JOHNSTONE.

ACKNOWLEDGEMENT.

Many officers of the Department of Agriculture and Stock have been associated with the work of the Bureau of Tropical Agriculture over the past decade. The grassland work has been a continuation of the work commenced on the late Mr. Brice Henry's property ten years ago. This is, therefore, a comparatively young station but its progress is a tribute to the ready co-operation and enthusiasm of all those who have, in some measure, contributed towards its success.

* *Pueraria hirsuta* Scheid.

4

STORY OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

PART 4.

(*Continued from page 12, Q.A.J. for January.*)

J. F. F. REID.

FROM 1909 until the outbreak of World War I. in 1914 was a period of continued expansion of departmental activities.

In 1910 some notable staff changes were made as a consequence of the resignation of Dr. Sydney Dodd, who in 1907 had entered on a three-year engagement with the Department for research work in animal diseases as Principal Veterinary Surgeon and Bacteriologist, in the course of which the Yeerongpilly Stock Experiment Station was established. The work of the station was continued by A. H. Cory (afterwards Chief Inspector of Stock) and C. J. Pound, Government Bacteriologist. A. H. Benson, Instructor in Fruit Culture, who had previously been with the New South Wales Department of Agriculture as Fruit Expert, also resigned to become Director of Agriculture in Tasmania; he rejoined the Department in 1915 as Director of Fruit Culture in Queensland, and remained with it until his retirement in 1927.

RURAL CO-OPERATION.

During this period the rural co-operative movement continued to advance rapidly, particularly in the dairying and pig-raising districts. This movement towards farmers' co-operation was facilitated by legislation providing for financial assistance and which was administered by the Department.

In 1900 the whole of the business of processing dairy products was in the hands of proprietary companies. In 1901, the Queensland Farmers' Co-operative Company was formed and commenced butter manufacture at Booval. From that time onward the co-operative movement made rapid progress, and the dairy industry in Queensland on its manufacturing and marketing sides is now almost entirely under producers' co-operative control. The extension of the principle of co-operation to bacon manufacture and distribution was a natural corollary, and most of the large treatment plants are owned and directed by farmers.

IMPORTATION OF PURE-BRED STOCK.

While on a visit to Europe, John Mahon, the Principal of the Queensland Agricultural College, was commissioned to purchase on behalf of the Department some pure-bred stock, including horses, cattle, pigs and poultry, for the purpose of improving breeding standards. During his absence abroad, the college was administered by H. C. Quodling.

The demand for College-bred stock continued far in excess of the supply, especially of pigs required for foundation herds in the new dairying districts.

A teachers' course attended by 60 State school teachers from many parts of Queensland during their mid-winter vacation was held that year and proved highly successful in its results.

A school of instruction for cheese factory managers was another innovation at the college, with the object of improving quality in the export trade, which was growing rapidly in economic importance.

Reafforestation of a portion of the agricultural college lands at Gatton was under consideration. "Reafforestation should follow the denudation of the land of its natural timber," commented the Under Secretary (Scriven) in his report for the year, "not only from a college point of view, but also as an object lesson to the farmers to go and do likewise on lands . . . stripped of timber."

FARM APPRENTICESHIP COURSES.

It was considered that the farm apprenticeship courses instituted at the State farms at Hermitage and Biggenden three years earlier had been sufficiently long on trial to justify official comment: "The result fully justifies the experiment which was instituted to provide a means of learning practical agriculture for lads, residents of towns for the most part, whose parents are not in a position to pay the expenses of an education at the Agricultural College. The statements by letter or orally from the parents have been a high commendation of the officers to whom the education, morally as well as agriculturally, of these lads has been entrusted for varying periods up to three years . . . The facility with which employment has been obtained by those who have received instruction has fully warranted the experiment, which by its continuance is providing a steady rivulet of good farmers for the well-being of the State."

This system of farm apprenticeship was to be extended to the Roma State farm, beginning with four apprentices, an annual recruitment of three, until a full complement of ten was employed. The appointment of a science master at State farms employing apprentices to supplement the practical instruction of the respective managers was suggested.

The establishment of a State farm at Kairi on the Atherton Tableland in the 1910-11 departmental year marked, as stated in the annual report, "the completion of a desire long expressed by farmers in that neighbourhood for help and education in the later methods of agriculture and will, it is hoped, result in a larger use being made of those fertile lands by our own people instead of continuing the present system, much favoured there by landholders, of leasing those fertile lands to people of other races."

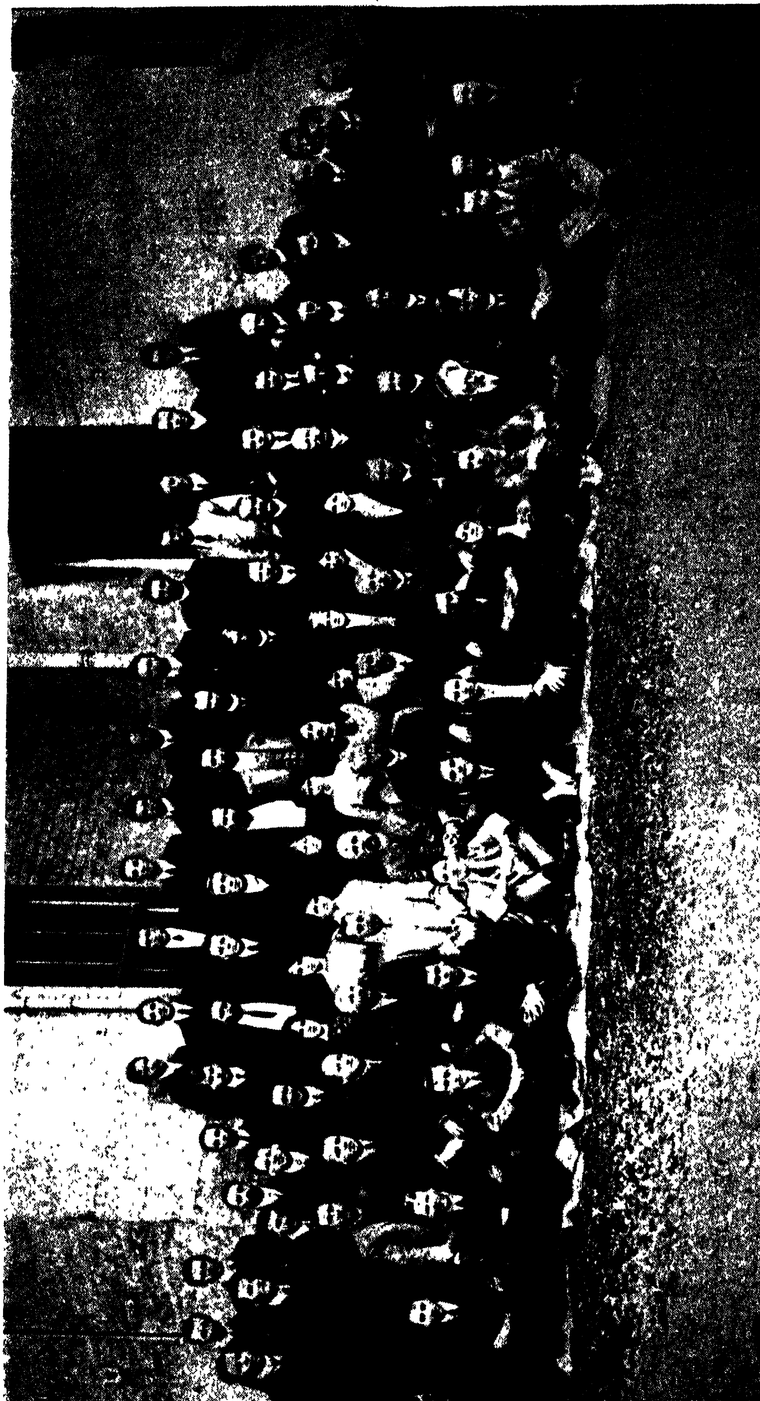


Plate 33.

STAFF OF THE DEPARTMENT OF AGRICULTURE AND STOCK, 1913.

As to State farms generally, the departmental report for 1910 contains this comment: "Much has been said to the detriment of the farms, and to the effect that they involve an expenditure which is not repaid by the gain to the State. Such remarks when analysed, however, are found to have no weight and are based on generalities that will not bear questioning. The demand for the establishment of State farms comes from all quarters and emanates from those who appreciate the work of them . . ."

RURAL PROGRESS.

In the 1909-10 season, the total area under farm crops in Queensland amounted to 606,790 acres. In addition there were 41,310 acres in fallow; 108,438 under introduced grasses as permanent pasture; and 90,347 broken up, but uncropped.

During the first decade of the century, notwithstanding the severe drought losses of 1902, Queensland livestock figures showed the following increases: Horses, 21·6 per cent.; cattle, 15·5; sheep, 89·5; and pigs, 2·1.

Consequent on the subdivision of large estates into smaller holdings, the number of stockowners also increased greatly.

CHILLED BEEF.

The export of chilled beef in place of frozen carcases was engaging the attention of the meat trade towards the end of the decade. A trial consignment was well received in London. Other shipments followed, but the development of the chilled beef export trade was retarded by the limitation at that time of suitable shipping space for such cargoes.

A SUGAR RECORD.

A new record for the sugar industry was attained in 1910 when the raw sugar output totalled 210,756 tons, a record frequently exceeded, however, in later years. By 1939, a peak year in sugar production in Queensland when the sugar output aggregated 891,422 tons, of which 513,792 tons were exported, the 1910 record had been more than quadrupled.

VISIT OF SCOTTISH FARMERS.

A notable event of that year was the visit of the Scottish Agricultural Commission. A published report of the observations and experiences of its members contains many appreciative references to their Queensland journey across open rolling blacksoil downs and vast stretches of "undeveloped scrub, forest and jungle, with hill and valley following each other in a bewildering sequence of impressive beauty." With the potential wealth of North Queensland, the Scottish farmers were deeply impressed. In their report, published subsequently in volume form*, they wrote: "From Cairns an expedition was made to Atherton . . . The route was by a picturesque line leading from the sea-level up the mountain side. The Queensland people have cause to be proud of their scenery. It is finely diversified and panoramic. Of all the scenes of beauty, possibly the Barron Falls stand out pre-eminent. But the whole distance travelled from Cairns to Yungaburra and Atherton is noteworthy for its picturesqueness and novel charm. The tropical vegetation with its infinite variety; the butterflies and birds whose brightly coloured wings sparkle like jewels in the sunlight;

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* *Australia, Its Land, Conditions and Prospects. The Observations and Experiences of the Scottish Agricultural Commission of* 1910-11.

the hills towering into the blue; the Barron River, now a raging torrent pouring its flood over the most rugged of rocks, now still and silent as a pool—all combined to make the journey unforgettable."

Of the Atherton Tableland they said: "The heavy timber still standing speaks of the quality of the soil. The land already cleared shows how well it repays labour and expenditure." They deplored the destruction of stands of valuable trees: "It is a pity, however, that the clearing of the Atherton land has involved the destruction of so much fine timber. The axeman has been ruthless. Doubtless the cost of conveying timber to Sydney, or even to Brisbane, is great, perhaps prohibitive, but surely such magnificent trees deserve a better fate than reduction to ashes." In after years the remaining stumps of many of these trees, notably walnuts, were profitably exported as highly valued cabinetwoods to America.

In the course of considered comment the Commissioners commended the standard of practical agricultural education already achieved by the Department at the Gatton College and on the State farms and demonstrational areas. Particular commendatory reference was made by one of the visiting Scotsmen, Dr. J. H. Wilson of the University of St. Andrews, a noted plant breeder of his day, to the wheat and other plant-breeding work then in progress at the Roma State Farm under the direction of R. E. Soutter.

A FISH EXPERIMENT.

The stocking of Queensland waterways with trout and other game fish has often been considered. From time to time efforts have been made to acclimatise trout, but apparently the only lasting success achieved with such projects is the stocking of some of the Southern border streams with head waters in the high country of the New England district of New South Wales. In 1910, arrangements were made through the Department for an experiment in acclimatising trout in the streams of the northern uplands around Herberton. The stocking of the surrounding country with introduced game birds, including pheasants and partridges from Britain, also was under consideration. An acclimatisation society was formed at Herberton to foster the game fish project. Rainbow trout ova were obtained through the New Zealand Department of Agriculture and from the hatchery of the Acclimatisation Society of Southern Queensland near Killarney (Queensland) and placed in a fish hatchery on the Wild River. Young fish were subsequently liberated in Nigger Creek and other northern tableland waters which were regarded as suitable, but no notable success was achieved by this experiment, probably because of the northern climatic conditions.

THE DAIRY INDUSTRY—CONTINUED EXPANSION.

Further expansion in the dairy industry in that year was reported by the Dairy Expert (E. Graham), who referred to an inclination of farmers in the wheat districts to change from grain growing to dairying; and also to the "possibilities of adding to our present production by the extension of railways to new country." An outstanding example of the wisdom of building railways in advance of settlement had already been provided in the South Burnett by the completion of plate laying to the 56-mile peg at Kingaroy before the opening for selection of the large tracts of dense vine "scrub" traversed by the new line. The South Burnett is now known as one of the most productive and progressive provinces of the Commonwealth.

John Mahon, who had been Principal of the Queensland Agricultural College for over 13 years died on 25th December, 1911. Throughout his career from the time he came to Queensland as manager of one of the travelling dairy plants and afterwards as Principal of the College, his constant aim had been to raise agricultural education and practice in the State to the highest attainable standard. Mr. H. C. Quodling was appointed Acting Principal.

The death of John Mahon was recorded in many Press appreciations of his service to Queensland as manager of a unit of the Travelling Dairy which attained a position of importance in the rural life of the 'nineties. It is appropriate, therefore, to give a brief account of that system of taking practical instruction to the farmer on his own farm, and which had a definite influence in the development of the dairy industry in this State.

Some years before 1888 a travelling dairy had been in operation in Victoria and had achieved such sound results and had so impresed the then Minister for Lands in Queensland (M. H. Black) that he decided to institute a similar system here. At that time, agricultural matters were administered by the Department of Public Lands.

Towards the end of 1888, the first unit of the Queensland Travelling Dairy was formed under the management of Baron Jones who had had experience of similar work in Victoria. His assistant was T. Spence, who was succeeded later by James McCormick. When Baron Jones retired, he was succeeded by Spence who, in turn, had as his assistant, F. J. Watson, who had been with the No. 2 T.D. Unit.

John Mahon came from Victoria, where he had had long experience as an expert in dairy practice, to start the No. 2 Unit of the Travelling Dairy in September, 1889. His assistant was C. Hitchcock, who in that capacity was followed successively by F. J. Watson, R. Winks, and Charles McGrath (afterwards Supervisor of Dairying).

The functions of the Travelling Dairy were to give farmers an idea of the butter and cheese factory system; to teach cheese and butter making on the farm; and to spread knowledge on the installation and use of separators. Included in the plant of each unit were a large cream separator operated by a horse gear (or whip); two hand separators; a cream testing outfit; two wooden box churns; a cheese vat, a cheese press, a curd rack, a curd cutter; and a quantity of cheese moulds.

Local committees of farmers were formed in each centre to make all necessary prior arrangements for the operation of the plant and attendance of farmers. The plant was conveyed by horse transport, whenever necessary, from the local railway siding to neighbouring rural centres. Before the Travelling Dairy ceased operations (No. 1 Unit in 1892, and No. 2 Unit in 1896) both plants had operated in most dairying districts in Southern and Central Queensland to as far North as Mackay.

The success of the Travelling Dairy, demonstrating as it did the widespread desire of farmers for technical agricultural education, led, it is said, to the founding of the Queensland Agricultural College at Gatton. On the opening of the College in 1897, John Mahon was appointed Principal and, under his direction, it became one of the most noted institutions of its kind within the Commonwealth.

[TO BE CONTINUED.]

VEGETABLE PRODUCTION

Marketing Queensland Tomatoes in Sydney.

J. H. SAINT-SMITH, Adviser, Horticulture Branch.

IN 1946, from the beginning of June to the middle of November, realizations for Queensland tomatoes were such that even average quality tomatoes could be marketed in Sydney at prices payable to growers. During the 1947 season the position was very different, and for considerable periods average quality Queensland tomatoes were sold at prices which would not cover the costs of production and marketing.

In 1946, 385,951 cases of tomatoes from Queensland were received in Sydney from 1st June to 28th September. In 1947, 322,820 cases were received for the same period. From a comparison of the weekly total quantities and the market quotes for these two years it is obvious that factors other than the total quantities received from Queensland were operating in determining market prices.

Production in New South Wales.

A comparison of the temperature and rainfall conditions in Sydney for the months of June, July, August and September, 1947, and the average for eighty-eight years shows that in 1947 the winter was much drier than the average. Also, it was somewhat warmer in 1947 than the average of the eighty-eight-year period, June mean average temperature being 1·9° F. above the previous average, July 1·5° F., August ·2° F. and September ·4° F. The effect of this warmer- and drier-than-average winter, which also was frost-free in Sydney, was to allow good quality tomatoes to be marketed from field crops grown near Sydney until September, and also to cause glasshouse-grown tomatoes to appear in quantity on the Sydney market in the first week of August instead of their usual time in the first week of September. The effect of this continuous supply of tomatoes, which could be and was marketed at low cost to growers and at just the stage of maturity which the particular market required, was to depress values of Queensland-grown tomatoes below figures which would be payable to growers, particularly for average and below-average quality consignments.

From the above facts it might be assumed that, because 1947 was not a normal year climatically, Queensland growers might expect higher prices for average quality winter and spring production in average years. This, however, is not likely to occur because of a number of factors, some of which are discussed here.

Glasshouse Production.

One factor which has some effect and which is now permanent is that between the years 1943 and 1946 a considerable number of glasshouses were erected within a few miles of Sydney and were paid off by growers when the average winter and spring prices for tomatoes were very high (up to 48s. a case in 1943). Although present returns may not make it possible for further large expansion of the area under glass, due to high capital cost, the fact remains that the present area yields approximately 2,000-3,000 cases a week, with an all-time record week of 20,000 cases, during the period when the market is usually largely supplied from Bowen and Yarwun.

Condemnations.

A considerable quantity of Queensland tomatoes has been condemned by inspectors of the New South Wales Department of Agriculture for diseases, immaturity and topping.

Most lines condemned during the coldest weather period in 1947 were condemned for immaturity. These condemnations cause some dismay to one accustomed to the time taken for tomatoes to ripen in Brisbane—where the mean average temperatures for the winter period are June 60·1° F., July 59·5° F., August 60·6° F. and September 65·3°—until it is realised that air temperatures in Sydney during the winter (even in such a "warm" winter as 1947, when the mean average temperatures were 56·6° for June, 54·5° for July, 55·5° for August and 59·7° for September) were below the most satisfactory ripening temperatures for tomatoes. At these temperatures mature green tomatoes will either ripen very slowly or ripen more or less abnormally, whereas in Brisbane mature green tomatoes will ripen at winter temperatures. This difference in ability to ripen at air temperatures causes the New South Wales standard for maturity to be different from the Queensland standard, although the wording of the Government regulations governing maturity is very similar in both States. Experience has taught the New South Wales inspectors that the ripening of green tomatoes during cold weather is very slow and frequently not normal and that skin-blemished tomatoes are likely to show severe wastage during ripening. Consequently tomatoes which were showing no red colour or which were blemished were withheld from sale.

Coloured tomatoes were also condemned in Sydney for immaturity if the tomatoes were very soft and the juice readily exuded when the fruit was cut. It is contended that such fruit must have been picked in an immature condition.

Other tomatoes were condemned for diseases and skin blemishes. No tolerance for such defects as "cat-face," growth cracks, diseases, insect damage, decay or sunburn are laid down in the New South Wales standards for tomatoes. Thus a considerable number of cases which could have been sold in Queensland as "B" grade could have been condemned under the New South Wales regulations. The number of lines condemned was greater than in previous years when the enforcement of the regulations was not so strict. The stricter enforcement in 1947 of regulations in relation to tomatoes applied to all consignments, irrespective of their origin.

Market Requirements.

The requirements of Sydney, for tomatoes in particular, have changed since the war. At present the market needs a much higher quality than satisfied it previously. The ideal requirements are—

(*a*) Fruit well packed with at least 24 lb. to the case.

(*b*) Fruit of the one size in the cases (New South Wales regulations allow of only ½-in. variation in size of tomatoes in a case).

(*c*) Fruit at least 2¼ in. in diameter (smaller sizes sell at much lower rates and depress the market for good sizes).

(*d*) Fruit of uniform maturity, with the maturity grade marked on the case. It is not possible to indicate one stage of maturity as being the most favoured, because at some times coloured fruits bring more than green—this frequently happens when the price is liable to fall—while at others mature green are preferred. However, it is most important that at all times tomatoes should be sufficiently mature that they will ripen normally—that is, arrive in Sydney showing a tinge of colour in winter and mature green in the warmer period.

(*e*) Fruit free from all defects. The most common defects are in relation to—

(1) Texture; tomatoes should be firm to very firm, as soft types are not wanted.

(2) Skin blemishes; clean-skinned tomatoes are necessary.

(3) Cat-face and other shape irregularities.

(4) Pests and diseases, of which *Alternaria* rots, bacterial rots, and mosaic are the most common affecting Queensland tomatoes.

(*f*) Cases to be branded with size and maturity as well as grower's name and address and consignee's number.

(*g*) Cases to be papered with clean paper.

(*h*) Cases to be new or, if not new, at least clean and free from dirt.

Whilst it is fully realized that commercial growers may not be able to market all their fruit in such condition, it must be emphasized that the nearer they approach such an ideal the nearer will their returns be to the highest realization on the market. Further, as freight and cartage—1s. 11¾d. per case from Bowen, as compared with 4d. per case for glasshouse tomatoes—are very considerable items for Queensland growers, the higher their realizations per case the lower the proportion of their returns which will be absorbed by these charges. Another point to be considered is that at present market quotations invariably show higher prices for tomatoes produced nearer Sydney than for those grown further away in Queensland, and this price difference is stimulating New South Wales production. This development could quite easily go on to such an extent that it would become unprofitable for many Queensland tomatoes to be marketed in Sydney except under unusual conditions.

Realizations show that the winter preference in Sydney for tomatoes is, first, glasshouse and local; second, Coff's Harbour; third, South Queensland; fourth, Bowen and Yarwun; and fifth, Home Hill and Proserpine. There is a tendency for Coff's Harbour to replace glasshouse for first place; this is because the New South Wales Department of Agriculture has been able to improve Coff's Harbour tomatoes by instruction to growers and by enforcement of grading regulations. During the coldest weather there is a preference for "coloured" lines ("coloured" means showing a tingle of colour up to three-quarters coloured but no riper).

Regulating Market Supplies.

Variation in Quantities in the Sydney Market.—Sydney market can very quickly change from a very short market to a heavily over-supplied one for tomatoes and *vice versa.* Supplies can be moved to Sydney from Brisbane or Melbourne in one day (by passenger rail from Brisbane or road transport from Melbourne); also local growers can rush in supplies to a short market.

Clearing the Market.—As it is a recognised fact that accumulations of inferior lots will depress values even for good quality, an examination of the facilities available for moving lower-grade tomatoes from the market is desirable. Winter tomatoes are not wanted by factories irrespective of price, because (1) the factories are busy on other products during the winter; (2) factories will not buy tomatoes in the winter just to clear the market when they can get regular and direct supplies in summer; (3) Bowen tomatoes are too pale and have too thick a skin for efficient manufacture of good quality products; (4) the wartime demand for processed tomato products has gone; (5) there is a tin-plate shortage.

Recent police action in Sydney has practically removed "pirate" barrowmen, who sold a considerable amount of inferior fruit and vegetables. Thus the only way to clear the market seems to be the enforcement of grading regulations. This also means that in times of extreme over-supply the market price can fall to levels just sufficient to cover the cost of marketing local Sydney tomatoes; such price levels would be unpayable to all Queensland growers.

Total Quantities which the Sydney Market can Handle.

The maximum total quantities of tomatoes which could be profitably marketed in Sydney from Queensland cannot be ascertained, and, even if it could for one set of conditions, it would be only misleading for other conditions. For the calendar year 1946, 689,461 cases of Queensland tomatoes were received in Sydney by C.O.D. trains, and at all times the best quality returned growers payable prices. In the week ending 12th October, 1946, 42,887 cases were received, and the price range was 7s. to 16s.; yet in the week ending 1st June, 1946, there were only 2,705 cases received, and the price range was 6s. to 12s., due to considerable New South Wales supplies. It must also be remembered that the Sydney market can supply to or draw from the three eastern States; that the Melbourne market is supplied by Western Australian field-grown and South Australian glasshouse-grown tomatoes during the winter and spring, and that even these can quickly be moved to Sydney if prices are attractive. In a normal year, the Sydney market is lightly supplied from local sources from June to August inclusive.

The chief producing areas supplying Sydney are—

1. *New South Wales*—
   (*a*) Metropolitan, field grown, December to May, large amounts;
   (*b*) Metropolitan, glasshouse, August to November, large amounts (not early hothouse);
   (*c*) Coastal and inland—comprising (i.) Murrumbidgee Irrigation Area, January to June, in large quantities; (ii.) northern coastal, consisting of Coff's Harbour, Port Macquarie and Far North Coast, from September to early October to December, in large quantities.
2. *Victoria*—Shepparton and Portland in February.
3. *Queensland*—
   (*a*) Bowen, Yarwun, in winter period;
   (*b*) Redland Bay, usually in autumn and October-November;
   (*c*) Stanthorpe in February.

Artificial Ripening.

There are a number of ripening rooms in Sydney used for colouring tomatoes. However, there is some doubt as to whether it is economically sound to handle green tomatoes in ripening rooms in view of low prices, handling costs involved, variations in market prices and the fact that, although immature tomatoes may be coloured, they are not properly ripened by artificial treatment. It is estimated that at present about 10 per cent. of Queensland tomatoes are either ripened or repacked by repackers during the winter, but these operators have, on a number of occasions, made considerable losses on their dealings.

Method of Selling on Sydney Market.

Tomatoes are sold in Sydney in grower's lines. Other things being equal, there is a preference for large lots over small lots, as under these conditions the buyers for the larger shops and country order trade can obtain their requirements at one place and time and will pay for this privilege by giving slightly more for the same quality. The fact that sales are by grower's lines means that the grower's name on the cases helps or hinders the sale of the line according to the usual quality sent.

Recommendations.

The above summing-up of market prospects may seem gloomy from the Queensland point of view, but it is only by facing the facts and taking prompt remedial action that production in coastal Queensland can be maintained on a profitable basis.

The suggested action to be taken includes—

(*a*) Much greater care to be taken in the selection of suitable varieties. Some types are definitely unsuitable. These include all the soft ripening types, such as Pearson and all varieties which ripen to other than a full red colour, such as the Bowen Buckeye Globe. To assist growers in this respect, the Department of Agriculture and Stock is planning to expand its variety-testing programme into all the main tomato-producing districts.

(*b*) Strict adherence by growers to the grading regulations of both New South Wales and Queensland.

The Case for the Mules Operation.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

ALTHOUGH fifty years have passed since the blowflies that strike sheep first appeared in Queensland these parasites still constitute one of the greatest troubles facing the pastoral industry. More than once large rewards have been offered for the control of strike and it has been estimated that flies have cost Australia £3,000,000 per annum.

Various sources contribute to such a loss—high death rates, decreased lambing percentages, higher labour costs, lighter wool cuts and an increased proportion of tender fleeces, with consequent lowering of wool prices. In addition there has always been the fear in the minds of wool growers that a bad fly wave may be "just around the corner."

In Queensland a very large proportion of all strike occurs in the breech of ewes. There are some districts where body strike is quite prevalent at certain times of the year and in almost all pastoral areas a bad fly wave occurs every few years when strike may originate in situations other than the breech. The fact remains, however, that for the majority of sheep under average seasonal conditions breech strike, which includes strike originating on the crutch or on the tail, is far more common than any other type.

The control of breech strike then is of paramount importance to the sheep industry and it is a problem which has received a good deal of attention from wool growers and scientists working in closest collaboration. As a result means have been provided whereby breech strike of sheep in Queensland can be reduced so that it is no longer a source of economic loss.

The prevention of breech strike is not dependent upon any one method, though certain procedures are more important than others, and the purpose of this article is to describe the various methods which might be employed to reduce losses from breech strike to a minimum.

THE CAUSE OF STRIKE.

In order to understand the control of breech strike it is necessary to appreciate the cause of strike. Two factors are important in its development:—(1) blowflies; (2) sheep which are attractive to the flies.

Wool growers often suggest that it would be preferable to attack the blowfly problem by decreasing fly populations. In practice, however, a much more effective control is attained by reducing the attractiveness of the sheep. This, incidentally, removes the breeding ground of the flies, as it has now been demonstrated clearly that the green flies which initiate strike breed much more freely in struck sheep than in carcasses.

The attractiveness of sheep to blowflies depends largely upon putrefactive odours which result from an area of local inflammation of the skin. This is initiated, in the majority of cases of breech strike, by moisture which comes almost entirely from urine or faeces. Skin which is constantly wet becomes red and sore and bacteria flourish in the exudate on its surface. The odours which arise from these changes are attractive to blowflies and, should these be present, eggs are soon laid on the moist parts of the fleece. The maggots which soon develop find warmth, food, moisture and protection, and accordingly they flourish at the expense of their unfortunate host.

Several factors predispose to the commencement of bacterial activity likely to produce odours attractive to blowflies. They are:—

1. The conformation of the breech of the sheep, with special reference to the extent of the unwoolled skin surrounding the urino-genital opening and to the wrinkliness of the skin of the crutch.

2. The way in which the sheep's tail has been cut.

3. The length of the wool on the crutch.

PREVENTING CRUTCH STRIKE.

Crutching.

Because of the importance of wool length, crutching is commonly employed as a method of controlling breech strike. The cost, which often approximates 2½d. per sheep, is a disadvantage as only about six weeks protection is given. Accordingly it may have to be repeated two or three times in a bad year. Another disadvantage is that a certain amount of organising, such as engaging teams and mustering sheep is often necessary before the work can be undertaken. As the result of such delays heavy losses, due to fly strike, may be incurred.

Spretting and Jetting.

Spretting and jetting are much more readily applied than crutching and can be quite effective, depending upon the thoroughness with which the work is performed. In a survey made during the six years, 1941 to 1947, it became clear that jetting is rather badly done in the majority of instances. As it is usually carried out by the available station labour, it requires the minimum organisation and can be undertaken at any time, provided the necessary plant is available.

The protection given depends partly on the materials used. These cost only about ¼d. per sheep, but, even when carried out under the best conditions, jetting or spretting will rarely protect sheep for more than four or five weeks. Accordingly the sheep may have to be treated on several occasions during the year, so the total cost for materials may be as high as 1d. to 1¼d. per head. In addition there is the capital

charge against the plant and equipment to consider. This varies with the type of plant and race used, but it may be as high as 2d. per sheep per annum and it should be remembered that this is a charge which goes on, year in, year out, irrespective of whether the plant is used or not.

Additional mustering and handling of the sheep are involved in these operations, especially when they have to be undertaken several times during the year, and this can be expensive because, besides the labour charges incurred, repeated working of the sheep through yards may make the wool very dusty.

Plate 34.

SHOWING THE STRETCHED BARE AREA ON A LAMB ONE MONTH AFTER THE MULES OPERATION.

Docking and the Mules Operation.

The two most recent developments in blowfly control have focussed attention on the Mules Operation and the importance of correct tailing of lambs.

Many woolgrowers do not seem to realise that the main and most important effect of the Mules Operation is to stretch the bare area surrounding the urino-genital opening, which is clearly demonstrated in Plate 34. In correctly treated sheep the bare area usually measures about 4 inches across, as against about 1¼ inches in untreated animals. In this way repeated soiling, by urine, of the wool-growing skin is prevented, and this means of course that areas attractive to flies will not develop. It is an acknowledged fact that wrinkly breeched sheep are more susceptible to strike than plain-bodied sheep and, because of this, the late Mr. J. W. H. Mules suggested the surgical removal of the

crutch wrinkles likely to cause trouble. The present technique used in performing the Mules Operation, which was developed by C.S.I.R., removes any crutch wrinkles which may be present, but its effectiveness does not depend entirely upon this fact as the following experimental results indicate:—

Class of Sheep.	Percentage Crutch Strike in 12 Months.	
	Mules Operated (Off Shears).	Untreated.
Completely plain breeched sheep	4	19
Wrinkly breeched sheep	4	98

These figures demonstrate clearly that the Mules Operation can give added protection from crutch strike even to plain breeched sheep and this of course results entirely from the stretching of the bare area.

Recent investigations have shown that two factors are of major importance in the docking of lambs' tails:—

(1) The way in which the tail is cut;

(2) The length of the tail.

In lamb marking it is important to turn the bare skin from the under surface of the tail back over the severed stump. On healing this means that there is no wool-growing skin opposite the vulva in a position where it is likely to become soiled by urine. Under these circumstances areas attractive to flies are not likely to develop on the tail and this will mean a material reduction in the incidence of strike.

The length of the tail is important for two reasons. The rapidity with which the tail heals after being docked depends upon whether the wound becomes infected or not. It has been found that cutting lambs' tails short increases the risk of infection entering the wound, whereas, if the tail is cut long enough to cover the tip of the vulva, the chances of infection are greatly decreased. This means that lambs' tails cut at this length heal more rapidly than the ones which are cut shorter.

In addition longer tails, that is, those cut level with the tip of the vulva, confer a marked degree of protection against strike originating on both the tail and in the crutch, as the following results indicate:—

THE EFFECT OF TAIL LENGTH.
(EWES NOT MULES OPERATED).

Tail Length.	Percentage Crutch Strike in 12 Months.	Percentage Tail Strike in 12 Months.
Vulva Covering	29	4·8
Medium	45	10·7
Short	53	17·9

The importance of correct tailing methods can be readily appreciated when it is remembered that every lamb has its tail cut and the way in which the docking operation is done can influence the

susceptibility of the sheep to fly strike for the rest of its life. Very much the same thing applies to the Mules Operation. Correctly applied it means protection to the sheep for the rest of its life. The labour costs of performing the Mules Operation, mustering and returning the sheep to their paddock is about 2d. per head and this, spread over an effective life of about six years, is approximately ⅓d. per annum.

When combined with optimum tail lengths the Mules Operation is capable of giving a phenomenally high degree of protection against breech strike, as the following results from controlled experiments indicate:—

PERCENTAGE BREECH STRIKE IN 12 MONTHS.

—	Vulva Covering Tail.	Short Tails.
Mules Operated	Per cent. 0·9	Per cent. 8·3
Untreated	20·9	56·2

The Arguments Used Against the Mules Operation.

Despite the fact that the Mules Operation has given excellent results under field conditions for the last five years in Queensland, where there are now well over one million treated sheep, and its application to all sheep would help to eliminate crutch strike, many wool growers are antagonistic to its use. One notable feature about the controversy is that those who oppose the Mules Operation have never tried it, while all wool growers who have given it a reasonable trial are enthusiastic about its merits!

The following arguments are often advanced against the Mules Operation:—

1. *Cruelty.*—Some wool growers, most of whom have done a good deal of lamb marking and the other usual operative procedures undertaken by men on the land, consider the Mules Operation to be cruel. No doubt the man who is keen on his sheep is anxious to protect them from any unnecessary suffering and there is probably none worse than that caused by repeated attacks by blowflies. As the Mules Operation is such an efficient preventive against crutch strike it is the obvious method to adopt to prevent the suffering it causes. When performed by an experienced operator it is done quickly and easily, healing is rapid and the sheep are comparatively safe from crutch strike for the rest of their lives. Surely it is a good deal kinder to the animals to perform the operation and protect the sheep for life rather than to let them endure the misery and discomfort of several strikes!

2. *Why Treat Plain Breeched Sheep?*—It is often stated by wool growers that their sheep are bred for plainness of breech and accordingly there is no need to perform the Mules Operation. Obviously these people have not appreciated the importance of the stretching of the bare area and they consider the Mules Operation to be simply a matter of de-wrinkling. The answer to their argument is found in Plate 34 and in the results set out in the table on this page, showing that Mules-treated sheep are less susceptible to crutch strike than perfectly plain breeched untreated animals.

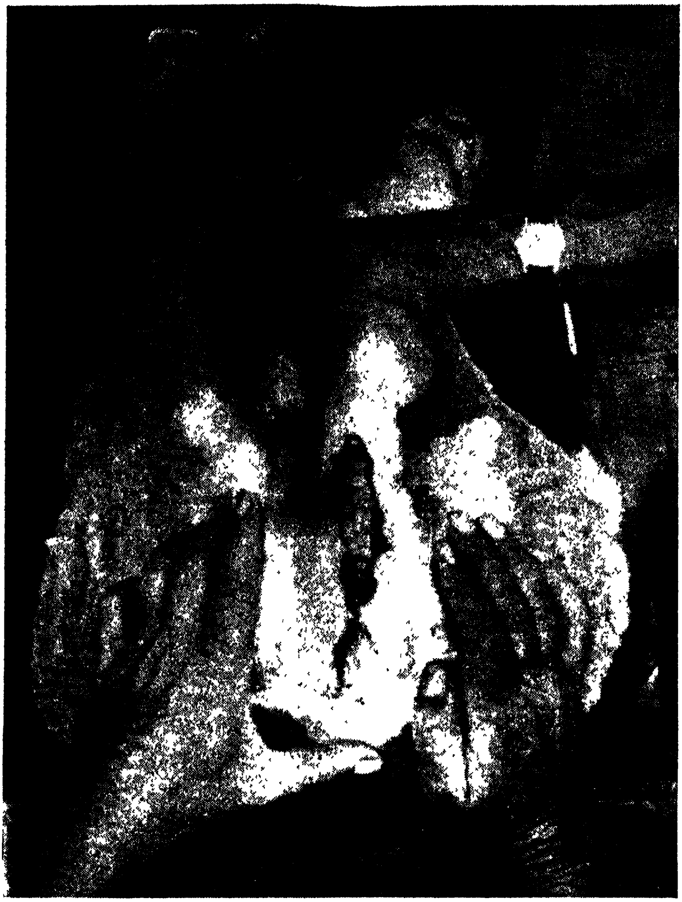

Plate 35.

SHOWING SPECIAL TAIL OPERATION.

3. *Disguising Wrinkly Sheep.*—Some growers object to Mules Operation on the grounds that it disguises wrinkly breeched sheep and they consider this may upset their breeding policy. Actually the Mules Operation does not interfere with breeding policy at all, as any slight alteration it makes to the conformation of the sheep is hardly likely to deceive the experienced sheepman. In addition, field observations indicate that sheep which would have been culled for excessive development would most likely have some other defect that would lead to their being rejected from the flock.

In any case when in doubt it is always possible to perform the operation on sheep after they have been classed into the flock or stud.

4. *The Longer Tail and Increased Shearing Costs.*—Some wool growers object to the longer tails because of the increased rates which have to be paid for shearing. The decision must surely rest on which will be most expensive—paying a couple of pounds per thousand extra for shearing or standing the losses resulting from several hundred strikes per thousand sheep per year.

In any case, if it is not considered desirable to cut the lambs' tails long enough to cover the tip of the vulva, consideration can be given to performing an operation to remove a considerable amount of the wool-bearing skin from the dorsal surface of the tail.

This is most easily done at marking time before the tail is docked. Sharp dagging shears are used and the cut should commence well above the base of the tail with a sharp "V" and gradually extend in width leaving a thin fringe of wool-growing skin on either side. The cut should extend well down the centre of the tail and the end result is shown in Plate 35.

This operation draws the wool-growing skin well up over the mid-line of the tail, thus helping to protect against tail strike.

The Mules Operation and Production.

The development of efficient methods of controlling breech strike made it possible to study the effect of blowfly strike on wool production and on lambing percentages. The results, which are set out in the following tables, of some of the experiments conducted by officers of the C.S.I.R., make it perfectly clear that Mules Operation protects against the losses caused by fly strike due to:—

Decreased wool production,

Decreased proportion of tender fleeces in a clip,

Decreased lambing percentages.

WOOL PRODUCTION AND STRIKE.

DIFFERENT SIZE STRIKES AND WOOL PRODUCTION.

Mules Operated.		Not Mules Operated..			
Average Wool.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
Weight (greasy)	12 4	12 0	12 0	11 11	11 6
Strikes	..	1 small	2/4 small	1 medium	1 large

STRIKE AND TENDER WOOL.

Strike Size.		Percentage Sound.	Per cent. Tender.
Not Mules Operated ..	Small/medium	85	15
	1 or more large	56	44

FERTILITY AND STRIKE.

FERTILITY OF EWES, STRUCK AND UNSTRUCK.

Ewes.	Percentage Wet.	Percentage Lambs.
Not Mules Operated, Struck	75	79
Mules Operated, Unstruck	92	100

EFFECT OF MULTIPLE STRIKES ON FERTILITY.

Number Strikes.		Percentage Ewes Wet.
Mules Operated	0	92
Not Mules Operated	1	88
,,	2	73
,,	3	58
,,	4	47

Thus by decreasing crutch strike the Mules Operation assists to maintain wool weights, improve lambing percentages, decrease the proportion of tender fleeces and assures a better price for the clip.

Other Advantages of the Mules Operation.

There are several other indirect advantages to be derived from applying the Mules Operation. These may be stated as follows:—

1. *Crutching.*—It is far easier to crutch sheep which have been treated by the Mules Operation. This is an important factor both to the man who does his own crutching and to the owner who has this work done by contractors. It means better work and greater contentment amongst the shearers and there are less stained pieces.

2. *Jetting and Spretting.*—While it is not usually necessary in Queensland to jet or spret sheep which have been treated by the Mules Operation and which are crutched once a year, it may have to be done if it is difficult to arrange for crutchers. Should this occur, it will be found that it is a good deal easier to get even penetration of the wool by the jetting fluid. This of course means better jetting or spretting and better protection.

3. *The Fly's Breeding Ground.*—It has been shown conclusively that the primary fly, that is, the one which initiates the majority of strikes, breeds mainly in strike on living sheep. The Mules Operation virtually robs the fly of its breeding ground and in this way it is an important direct attack on the fly population itself.

4. *Relief from Worry.*—One of the most important indirect advantages of the Mules Operation is the mental relief it affords owners and managers, who in the days before the Mules Operation could never feel quite certain that there was not a bad smash just around the corner as the result of a fly wave suddenly developing. If the sheep have been subjected to the Mules Operation even the worst fly wave is unlikely to be responsible, either directly or indirectly, for heavy losses.

5. *Property Management.*—The Mules Operation has an immense effect on property management. It reduces blowfly control measures to a minimum and what used to be a continuous and onerous task is now a simple job, which can be expeditiously performed. This means more time is available for constructive work such as the erection and maintenance of improvements. This was well borne out during the war when station labour was difficult to obtain. Properties which practised Mules Operation on each year's "drop" of ewe weaners soon had complete flocks which had been treated. Relieved of the work usually associated with fly control, the available labour could be devoted to constructive work.

CONCLUSIONS.

In the light of present knowledge, which has been gained from carefully planned experiments and substantiated by extensive field experience under most severe fly wave conditions, the control of breech strike is readily achieved in Queensland by adopting the following methods:—

1. Performing the Mules Operation correctly on all ewes, and where necessary on the wethers.

2. Cutting lambs' tails at the optimum length, that is, level with the tip of the vulva, and turning the unwoolled skin from the under-surface of the tail back over the severed stump and/or performing the special tail operation.

3. Undertaking a mid-season crutching.

4. Should an emergency arise, which prevents the usual crutching, jet or "spret" if necessary.

As the emphasis is on performing the Mules Operation *correctly*, seek the assistance of a Sheep and Wool Adviser, who will demonstrate the correct technique to use.

Plate 36.

A TYPE OF A BRITISH BREED (HAMPSHIRE CHAMPION RAM LAMB). First Prize and Challenge Cup at the famous British sheep fair held every year at Salisbury, England, in July; exhibited by Sir William Rootes.

PLANT PROTECTION

Control of Corn Ear Worm on Tomatoes.

I. F. B. COMMON, Assistant Entomologist.

FOR some time, DDT has been available to tomato-growers and many have been using it in dust or spray form to control the corn ear worm or tomato grub.* This insecticide has been tested experimentally in Central Queensland and recommendations can now be made concerning its effectiveness against tomato pests.

Pest control on tomatoes is necessarily linked with disease control. Hitherto, lead arsenate has been the insecticide in general use, and it has been a constituent of composite dusts and sprays designed to combat corn ear worm, tomato mite,† and various fungus diseases, such as target spot. The recommended combination dust contained 5 parts of lead arsenate, 3 parts of sulphur, and 2 parts of copper carbonate. The combination spray, on the other hand, included 1½ to 3 lb. lead arsenate, 1 lb. colloidal sulphur, and 2½ lb. copper oxychloride (equivalent to 4-4-40 Bordeaux mixture) to 50 gallons of water.

When lead arsenate, used either alone or in combination dusts and sprays, was applied thoroughly at 7–10 day intervals, corn ear worm was usually kept in check. At times, however, when the pest was very active, considerable fruit losses were experienced even when the insecticide was applied at 7-day intervals. Moreover, a coverage which is thorough enough to be effective tends to aggravate the poison-residue problem at harvesting.

DDT Dusts.

In many vegetable-growing areas, insecticidal dusts are preferred to sprays, so early experimental work was designed to compare dusts containing 2 per cent. DDT and those containing 50 per cent. lead arsenate, either alone or in combination with sulphur and copper carbonate. It was soon evident that a dust containing 2 per cent. DDT alone or mixed with sulphur and applied at 14-day intervals gave a control of corn ear worm comparable with that obtained from the composite lead arsenate-sulphur-copper carbonate dust applied weekly. The leaf-eating looper,‡ however, was not controlled by the DDT dusts used. Furthermore, copper carbonate or copper oxychloride mixed with DDT in a combined dust markedly reduced the efficiency of the insecticide. Thus, where DDT dusts are substituted for lead arsenate in pest- and disease-control schedules on tomatoes, the copper fungicide must be applied to the crop separately, allowing a few days to elapse between the two treatments. In general, therefore, DDT cannot be recommended as a substitute for lead arsenate in composite dusts for tomatoes.

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* *Heliothis armigera* Hbn.
† *Phyllocoptes lycopersici* Mass.
‡ *Plusia argentifera* Gn.

At present, there is some justification for using DDT dusts on tomatoes in districts where the tomato jassid* and the potato tuber moth† are pests. Whereas lead arsenate will not control these insects, DDT in dust or spray form has proved highly effective. In such cases, a dust containing DDT and sulphur should be applied at fortnightly intervals, followed seven days later on each occasion by a copper fungicide. This schedule, therefore, necessitates treatment with the DDT-sulphur dust and a copper fungicide in alternate weeks.

DDT Sprays.

In further experiments, DDT sprays have been compared with DDT and lead arsenate dusts against corn ear worm on tomatoes. In each case it was ascertained that DDT applied as a spray is the most effective insecticide so far used against this pest. When the plants were treated with an 0·2 per cent. spray at fortnightly intervals from the commencement of flowering, fruit loss due to corn ear worm was of a very low order. Furthermore, it appears that both sulphur and copper oxychloride may be incorporated in DDT sprays with little or no detrimental effect upon the insecticide.

A general recommendation can accordingly be based on these results. Fortnightly applications of a composite spray containing water-dispersible DDT powder, wettable sulphur, and copper oxychloride should provide a very high degree of control of corn ear worm and also keep in check tomato mite and fungus diseases. As this spray contains DDT, it also controls jassids and the potato tuber moth. Treatments should begin when the plants commence to flower and continue until picking has reached a maximum.

DDT Does Not Control Mites!

It should be emphasized that the use of DDT dusts or sprays on tomatoes does not dispense with the necessity of applying sulphur regularly to control tomato mite. Fortunately, sulphur may be incorporated in both dusts and sprays containing DDT. The grower, therefore, should not neglect this very important aspect of pest control.

Spray or Dust Residues.

Regulations provide that tomatoes, when marketed, must not carry arsenical deposits in excess of ·01 grains of arsenic trioxide per pound of fruit. Until more is known about the effect of DDT when consumed by humans, DDT residues must also be kept at a low level. Growers should, therefore, ensure that all fruit, whether treated with lead arsenate or DDT, is thoroughly cleaned before marketing.

Conclusions.

The following recommendations should be a practical guide to growers:—

(1) For general use, apply fortnightly treatments of a DDT-sulphur-copper oxychloride spray. It should contain 2 lb. of 50 per cent. water-dispersible DDT powder, 2 lb. wettable sulphur, and 2½ lb. copper oxychloride to 50 gallons of water.

---

* *Empoasca terra-reginae* Paoli.

† *Gnorimoschema operculella* Zell.

(2) If a dust is required where corn ear worm and leaf-eating looper are the major pests, apply a standard combination lead arsenate-sulphur-copper carbonate dust at 7-day intervals. It should contain 5 parts of lead arsenate, 3 parts of sulphur, and 2 parts of copper carbonate. An occasional extra treatment with a DDT dust or spray, when corn ear worm is very active, will improve this schedule.

(3) If a dust is required in districts where jassids or the potato tuber moth are prevalent, then apply a DDT-sulphur dust (containing 2 per cent. DDT and 30 per cent. sulphur) at fortnightly intervals, with applications of a copper fungicide (containing 7-10 per cent. copper) seven days after each DDT treatment.

Scab Disease of Gladiolus.

T. McKNIGHT, Pathologist, Science Branch.

THE rapid increase in the commercial production of gladioli has been accompanied by a more intense interest in the diseases and insect pests of this flower. Scab disease, caused by a bacterium*, is the major disease of gladioli in Queensland and has caused considerable concern among growers over the last few years.

Despite its common occurrence the cause of the disease is not well appreciated and, particularly among new growers, the culling of diseased corms and the standard corm disinfection method are rarely adopted to keep the disease in check.

Symptoms.

The most readily recognised symptoms of scab disease are produced on the corm when the infection is more or less advanced, and consist of hard, sunken, dark brown to black lesions with a slightly raised margin or border (Plate 37). In the earlier stages of infection the spots are small and yellowish, becoming darker in colour and sunken as they enlarge, but leaving a slightly raised border around the lesion. A bacterial "sheen" or a more prominent gummy exudate may be seen on these spots in the early stages. On the husks the scab infection produces small oval or round spots with a water-soaked appearance which become dark brown or black as the husks dry out. On the leaves small, reddish-brown, slightly sunken spots may be produced (Plate 38).

In 1947 the "neck rot" stage of the disease appeared in some plantings. This may occur under wet weather conditions when the leaf spots coalesce in the region of the fleshy basal part of the plant to produce a gummy breakdown of the tissues which results in the collapse of the plant.

Control.

The gladioli scab bacteria live in the soil, and the folly of subsequently replanting an area where the disease has been present is obvious. Overseas workers have shown that the scab organisms survive for at

* *Bacterium marginatum.*

least two years in the soil, and that it is necessary to adopt a crop rotation system which does not include gladioli more often than once in four or five years in order to effect a commercial control of the disease.

Plate 37.

AFFECTED GLADIOLUS CORMS SHOWING THE PROMINENT SCABS.

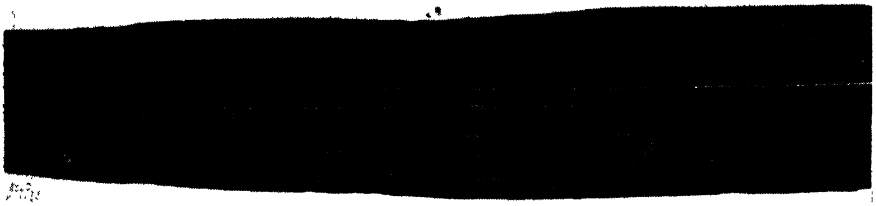


Plate 38.

SYMPTOMS OF SCAB DISEASE ON A GLADIOLUS LEAF.

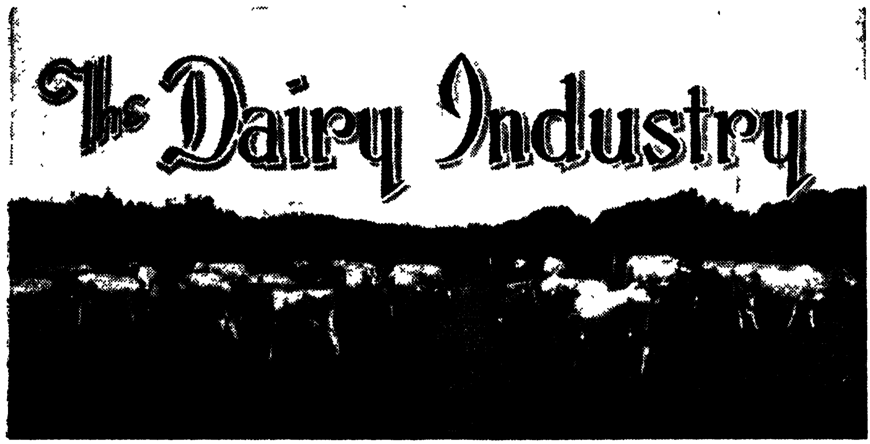
The standard treatment for the disinfection of corms involves the use of a 1 in 1,000 corrosive sublimate solution. Corrosive sublimate tablets, with directions for the preparation of the solution, are obtainable from chemists, or the solution may be prepared at the rate of 4 oz. corrosive sublimate to 25 gallons of water. The corrosive sublimate is dissolved in a small quantity of hot water, to which about 1 oz. of common salt has been added. This solution is made up to the required volume with cold water. The corrosive sublimate solution should be prepared in an earthenware or wooden vessel or in a metal container with the inside well coated with tar or a bitumastic paint. The corms should be completely immersed in the solution for twelve hours, removed and washed in running water, and planted immediately.

Corrosive sublimate is highly poisonous, and every precaution should be taken in its use.

Plate 39.

A DRAFT OF "FATS" ON KINGPAH, NEAR MOOGRA, WEST MORETON.—These bullocks, reared and fattened on Kingpah by Mr. J. Faulkner were sold in the paddock for £20 a head.

[*Photo., Department of Agriculture and Stock.*



Queensland Cheese Production.

E. B. RICE, Division of Dairying.

QUEENSLAND cheese production in 1946-47 was 17,291,768 lb. in comparison with 26,943,245 lb. in 1945-46. The values were £887,919 and £1,365,919, in the respective years. The decline in production was mainly attributable to the adverse season, but the diversion of large quantities of milk from the Toowoomba and Warwick factories for the Brisbane market milk trade was also a contributory factor.

Milk produced for cheese manufacture returned to the producer an average price of 2s. 3d. per pound butter fat. There was a slight change over from supplying cheese factories to producing cream for butter manufacture, but the price margin in favour of the cheese factory supplier ensured the retention of most suppliers to cheese factories.

Grading.

The scheme for reciprocity between Commonwealth and State officers in the grading of butter and cheese was continued this year. It enabled the official grading of a much higher proportion of the cheese production than could have been carried out by State officers alone. The total quantity graded was 9,480,521 lb. The grading results were as follows:—

	lb.	Per cent.
Choice and first grade	6,844,074	72.19
Second grade	2,453,233	25·88
Third grade	183,214	1·93

The above results are almost similar to those of the preceding season, the corresponding figures for which were 70·27 per cent. choice and first and 28·28 per cent. second. This is an achievement for which the cheese industry is to be complimented, for the protracted drought caused a serious imbalance of milk constituents, especially protein and mineral salts, which, in turn, created much difficulty in maintaining cheese quality. Butter fat content of milk received at some factories in the drought fell to the low average of 3·3 per cent., casein 2·2 per cent., and cheese yield 9·0 lb. per 100 lb. milk; the normal figures average fat 4·0 per cent., casein 2·7 per cent. and yield 10·7 lb. per 100 lb. milk.

Milk Grading.

Another pleasing feature was the decision of yet another three associations, including that with the largest number of factories and highest cheese output in the State, to introduce systems for the grading of milk supplies and payment of differential prices for milk according to quality. The methylene blue test is used as the only test for the grading of milk by Queensland cheese factories, and is proving quite satisfactory.

Bacteriophage.

Observations on the control of bacteriophage by propagating cheese starter cultures in a starter room completely isolated from the main factory building were continued. The starter cultures, both mother and bulk, were kept free from phage. Nevertheless, slow acid development during the making process was experienced on occasions. Factory hygiene was satisfactory and all equipment was rinsed with chlorine prior to starting manufacture every day. It seems that bacteriophage may be introduced in the milk cans used by suppliers in sufficient amount to slow acid production during cheesemaking. Investigations will be continued with a view to finding means for effective control of phage brought to the factory via farmers' milk supplies. The isolated starter room, by enabling propagation of phage-free starters, has, at least, minimised phage so that serious breakdown in acidity during manufacture does not occur.

Experiments are also being made in inoculating starter cultures in factories under a mercury quartz vapour lamp and also in using an "oil seal" on the starter milk to exclude bacteriophage from starter cultures.

Cheese Mites.

Reports have been received from England about mite infestation in Australian cheese. The increasing trouble in this connection was probably brought about by a lowered standard of curing room hygiene due to overcrowded premises as a result of the expansion of cheese manufacture, manpower shortage and the longer time of holding cheese in factories through irregular shipments in recent years.

In conjunction with officers of the Science Branch, Division of Plant Industry, investigations on the control of cheese mites (*Tyrophagus putrecentiae*) were made during the year. For ordinary cheese factory curing rooms the trials were made by spraying dichlorethyl ether by means of an atomising spray trigger gun with an adjustable fine spray nozzle. The atomising gun was fitted to a compressed air system and the apparatus operated at 70-75 lb. pressure per square inch. Standard army gas masks were used by the men doing the work. Dosage was 1 lb. per 1,000 cubic feet of room space. After the first treatment, the rooms were closed for 48 hours, then opened and aired, and all cheeses turned on the shelves. A second treatment was then given and the room again closed for about 72 hours.

The method of treatment has given good results inasmuch as all mites on exposed surfaces were destroyed, although mites under cheese and sometimes in cracks were not affected. Observations are being made over a six months period to see how long the rooms remain mite-free or, at any rate, in populations not serious enough to be of economic importance. Even if two or three applications to curing rooms may be needed yearly, the cost would be small and the method practicable for all cheese factories.

The investigations have been extended with the object of developing a method for treating large cheese maturing rooms such as at central cold stores. A method of utilising the dichlorethyl ether in gaseous form has been worked out and trials in the large cheese room at the Hamilton Cold Stores are in progress.

Non-Fat-Leaking Cheese.

For several years officers of the Division have been attempting to produce a type of cheese which would not exude fat at tropical temperatures. The advantages of such a cheese are obvious. The work was successfully accomplished and a factory has installed the necessary plant for commercial manufacture. Many enquiries have been received from the near East and other countries about the prospects of obtaining supplies of this cheese. It is understood export licences will not be issued at the present time.

Pliofilm Wrapping.

Preliminary trials with the packaging of cheddar cheese in consumer-size ½ lb. and 1 lb. packs, using a transparent, rubber wrapping known as pliofilm, were carried out. The packaging of cheese in this manner should prove a distinct sales advantage in the retail trade.

Varieties of cheese other than cheddar are evidently increasing in popularity among Queensland consumers, for their production is steadily expanding. Gouda cheese is now being made at one factory and ready sales are obtained.

Cheese manufacture was commenced during the year at the factory of the Queensland Farmers Co-operative Association, Booval. This plant was installed mainly to enable treatment of milk surplus to the market milk requirements of Ipswich during the flush production of summer.

Field officers are giving service to cheese factories in checking yields of cheese in relation to the composition of milk. These surveys assist factories in taking any action necessary to reduce avoidable losses during manufacture.

Table 1 summarises the results of the operations of all factories in the year under review.

SUMMARY OF PRODUCTION AND YIELDS OF CHEESE FACTORIES FOR YEAR ENDED 30TH JUNE, 1947.

	Lb.	
Milk Received ..	172,373,761	Yield of cheese per 100lb. milk, 10·32 lb.
Cheese Made	17,291,768	Yield per lb. of butterfat, 2·67 lb.
Butter Fat Paid ..	6,475,127	Average Test, 3·81 per cent.

GRADES OF CHEESE.

Total.	Choice.	First.	Second.	Third.
9,480,521	181,685 1·92%	6,662,389 70·27%	2,453,233 25·88%	183,214 1·93%

MANUFACTURE AND GRADINGS OF QUEENSLAND CHEESE FACTORIES FOR THE YEAR ENDED 30TH JUNE, 1947.

Factory.	Milk Received.	Production and Yield.						Gradings of Cheese.			
		Cheese, Green Weight.	Butterfat.	Cheese Yield.		Average Test.	Total Submitted.	Choice.	First.	Second.	Third.
				Per 100 Lb. Milk.	Per Lb. Butterfat						
	Lb.	Lb.	Lb.	Per cent.	Per cent.	Per cent.	Lb.				
Aubigny	1,352,855	138,521	50,146	10 24	2 76	3 71	137,168	..	91,514 66·72%	45,210 32·96%	444 ·32%
Biddeston	6,810,101	718,198	248,398	10·55	2 95	3 65	433,547	5,738 1·32%	404,093 93·21%	23,154 5·34%	562 ·13%
Coalstoun Lakes	1,692,297	171,146	62,865	10·11	2 72	3 72	42,150	..	..	35,470 84·15%	6,680 15·85%
Daredale	1,592,353	152,909	56,889	9 60	2 69	3 57	127,253	..	77,948 61·25%	48,260 37·93%	1,045 ·82%
Downs, Boodua	2,149,208	212,211	81,566	9 87	2·6	3 8	167,568	..	76,425 45·61%	85,086 50·78%	6,057 3·61%
Downs, Toowoomba	19,633,330	1,812,705	770,096	9 23	2 35	3 92	1,252,053	..	727,437 58·10%	471,490 37·66%	53,126 4·24%
Dundarrah	1,075,180	105,979	40,850	9 86	2·59	3 8	27,539	..	..	24,858 90·26%	2,681 9·74%
Felton	4,437,580	461.656	169,372	10 4	2 73	3 82	205,560	..	146,218 71·13%	59,342 28·87%	..
Greenmount	2,918,192	305,061	109,571	10 45	2·78	3 75	172,532	..	..	140,607 81·50%	31,925 18·50%
Highgrove	1,290,212	127,720	46,630	9·9	2·74	3 61	95,511	..	..	73,148 76·59%	22,363 23·41%
Irongate	3,896,995	380,470	140,378	9 76	2·71	3·6	355,033	35,005 9·86%	305,679 86·10%	13,702 3·86%	647 ·18%
Kelvinhaugh	1,427,098	149,286	52,520	10 46	2·84	3·68	130,953	628 ·48%	97,916 74·77%	32,098 24·51%	311 ·24%
Kooroongarra	3,833,060	387,683	140,680	10 11	2 76	3 67	360,880	9,066 2·51%	300,802 83·35%	51,012 14·14%	..
Lilyvale	1,928.498	201,618	72,393	10 45	2 79	3 75	174,439	6,247 3·58%	133,344 76·44%	34,848 19·98%	..
Maclagan	5.468,290	559,242	202,804	10·23	2 76	3 71	311,387	..	169,406 54·4%	136,786 43·93%	5,195 1·67%
Maclagan, Kulpi	4,004,335	395,671	144,472	9 88	2 74	3 61	312,178	..	265,759 85·13%	44,116 14·13%	2,303 ·74%
Malling	3,994,741	390,307	149,617	9·77	2 61	3 75	..	..	..	..	..
Maryborough, Tansey ..	4,174,265	423,964	174,884	10 16	2·42	4·19	113,807	12,359 10·86%	101,448 89·14%	..	..
Maxam, Cooranga North ..	4,268,545	465,568	172,807	10 91	2·69	4 05	334,253	13,560 4·06%	263,948 78·97%	55,380 16·57%	1,365 ·4%
Moola	2,728,772	266,772	96,572	9·78	2·76	3·54	99,184	..	92,833 93·60%	4,822 4·86%	1,529 1·54%
Mount Sibley	2,622,579	273,369	99,909	10 42	2·74	3 81	250,056	..	247,876 99·13%	2,180 ·87%	..
Mount Tyson	6,076,097	601,993	218,624	9 91	2·75	3·60	204,703	..	156,114 76·26%	46,349 22·64%	2,240 1·10%

Pittsworth, Pittsworth ..	6,049,048	587,344	237,230	9 71	2 48	3 92	255,901	1,436 ·56%	247,248 96·62%	7,177 2·80%	40 ·02%
Pittsworth, Brookstead ..	2,513,096	257,010	94,065	10·23	2 73	3 74	205,636	..	138,513 67·36%	67,123 32·64%	..
Pittsworth, Linthorpe ..	2,787,276	272,986	102,810	9·79	2·66	3·69	216,185	..	107,493 49·72%	108,692 50·28%	..
Pittsworth, Scrubby Mountain	2,244,602	231,770	83,401	10·33	2 78	3·72	163,913	..	107,900 65·83%	52,708 32·16%	3,305 2·01%
Pittsworth, Springside ..	2,472,721	261,338	91,126	10 57	2·87	3·69	173,988	54,186 31·14%	118,537 68·13%	1,265 ·73%	..
Pittsworth, Yarranlea ..	3,585,759	359,322	132,675	10 02	2·71	3·70	268,624	..	185,188 68·94%	82,472 30·70%	964 ·36%
Port Curtis, Bracewell ..	3,571,587	344,163	120,965	9 63	2 85	3·39	56,176	..	52,320 93·14%	3,856 6·86%	..
Port Curtis, Theodore ..	2,333,257	242,353	87,919	10 39	2 76	3·77	..	..	..	..	..
Q.A.H.S. and College, Lawes	23,496	2,402	958	10 22	2 51	4·08	..	..	..	..	..
Quinalow	4,239,864	419,088	149,867	9·88	2 80	3·53	243,985	..	181,143 74·24%	62,842 25·76%	..
Ramsay	1,728,153	171,660	65,663	9 93	2·61	3·80	164,213	..	108,929 66·33%	55,284 33·67%	..
Rockview	1,794,561	182,896	66,366	10 19	2 76	3·70	109,275	..	87,048 79·66%	22,227 20·34%	..
Rocky Creek	3,259,562	338,137	118,247	10 37	2·86	3·63	286,986	4,396 1·53%	173,407 60·42%	107,267 37·38%	1,916 ·67%
Rosemount	2,469,130	235,811	88,288	9 55	2·67	3·58	135,228	..	64,535 47·72%	61,165 45·23%	9,528 7·05%
Southbrook	6,714,230	669,495	243,357	9 97	2 75	3·62	325,516	..	285,141 87 60%	38,061 11·69%	2,314 ·71%
South Burnett, Goomeri ..	4,680,049	488,819	184,297	10 44	2 65	3 94	377,777	..	322,962 85·49%	54,815 14·51%	..
South Burnett, Murgon ..	4,018,783	387,911	153,172	9·65	2 53	3·81	46,546	..	29,681 63·77%	16,865 36·23%	..
Sugarloaf	1,624,411	160,871	64,423	9 90	2 50	3 97	129,491	..	83,976 64·85%	45,515 35·15%	..
Sunnyvale	1,305,048	130,535	52,162	10 00	2·50	4 00	66,388	..	3,693 5 56%	52,450 79·00%	10,245 15·44%
Warwick, Greymare	2,132,508	220,588	78,885	10 34	2·80	3·70	35,486	..	3,873 10·91%	27,450 77 36%	4,163 11·73%
Warwick, Talgai	1,095,823	108,607	41,575	9 91	2 61	3 79	..	..	..	..	..
Warwick, Victoria Hill ..	740,415	74,528	25,843	10 07	2·88	3 49	..	..	..	..	..
Warwick, Mill Hill	17,328,371	1,796,299	657,331	10 37	2 73	3 79	396,869	39,064 9 84%	331,630 83 56%	26,175 6·60%	..
Woodleigh	1,177,235	113,247	42,209	9·62	2 68	3 59	108,749	..	47,809 43·96%	52,034 47·85%	8,906 8·19%
Yamsion	2,170,826	235,335	80,394	10 84	2·93	3·70	223,905	..	143,560 64 12%	76,985 34·38%	3,360 1·50%
Yargullen	2,939,367	297,204	109,856	10 11	2 70	3·74	191,282	..	179,043 93·60%	12,239 6·40%	..
Totals	172,373,761	17,291,768	6,475,127	..	..	..	9,480,521	181,685	6,662,389	2,453,233	183,214

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S. Jersey, Guernsey, and Ayrshire Societies' Herd Books, production records for which have been compiled during the month of December, 1947. (273 days unless otherwise stated.)

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (STANDARD 350 LB.).				
Arolla Velvet 3rd	W. Hinricksen, Clifton	10,424 6	400 373	Parkview Limerick
Rosenthal Hansome 36th	S. Mitchell, Rosenthal	8,272 55	380 649	Rosenthal Archer
JUNIOR, 4 YEARS (STANDARD 310 LB.).				
Jamberoo Winnie 7th	Hart Bros., Headington Hill	12,595·45	477·857	Murray's Bridge Florrie's Prince
Rosenthal Choice 18th	S. Mitchell, Rosenthal	8,696·15	335·075	Rosenthal Lilac 4th Emblem
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Balatur Dainty	T. Fowler, Kenston	7,882 23	333 533	Fairvale Dairyman
JERSEY.				
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Brookland Merry Melrose	H. T. W. Barker, Oakey	4,991·7	313 626	Bulby Maria's Keepsake
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Englebourne Dainty	M. May, Hermitage	5,919 3	267 384	Oxford Floss' Remus
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Hocknell Bravo Melody	L. Harmer, Beaudesert	5,498·2	270·964	Navua Victoire's Lad
Windsor Lady Alice	H. T. W. Barker, Oakey	3,548·8	250·747	Brooklands Sultan's Victory
GUERNSEY.				
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Laureldale Pamela	W. A. K. Cooke, Maleny	9,399·6	438·802	Minnamurra Topsy's Sequel
AYRSHIRE.				
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Leafmore Harriet 3rd	J. P. Ruhle, Motley	9,706·3	344·849	Leafmore Jerrard

Ailments of Pigs.

A. L. CLAY, Divisional Veterinary Officer.

SOME of the ailments of pigs about which information is not always readily available have been selected for inclusion in this article. The information is by no means complete but sufficient is given to assist the reader to recognize the several conditions and have a working knowledge of what to do when confronted by them.

Middle Ear Infection (Otitis Media).

In this condition, the head is held to one side and the affected animal often walks round in a circle, the circling being in the same direction as that in which the head is held. In any event the pig has only partial control over its equilibrium, the gait is unsteady, and the sense of direction faulty.

The cause of the condition is an infection of the middle ear with one or other of the pus-forming bacteria, and the infection probably derives from the throat region by way of what is known as the Eustachian tube.

Pus may be present in the middle ear for some time before finally bursting through the ear drum and discharging externally. No discharge may therefore be apparent in the external ear until the case is of some considerable standing.

Treatment is unlikely to be satisfactory and as affected pigs are usually "poor doers" they are best written off as a dead loss.

Prevention is tied up with good management, and attention aimed at a better standard of housing and hygiene can be expected to eliminate the condition from the piggery.

Prolapse or Protrusion of the Rectum.

In this condition, the rectum (or hind gut) is protruded backwards through the anus. If seen soon after the prolapse occurs, the mucous membrane, which ordinarily lines the rectum but which now appears on the outside of the protruding structure, is red, moist, and glistening, but soon becomes dry, discoloured and, later still, cracked.

The cause of protrusion of the rectum is not always very obvious. It is sometimes seen in association with either diarrhoea or constipation. In both these conditions evidence of straining is of course present. Then

again any factor which causes irritation of the bowel may play a part. In this connection worms may be concerned and perhaps especially mass invasion of the bowel wall by worm larvae.

Protrusion of the rectum is most frequently seen in young pigs in the latter half of the suckling period. This corresponds with the period during which pigs are most prone to pick up infective worm eggs. No doubt this is only part of the full story but it is worth keeping in mind.

It is remarkable how at times nearly all pigs in a litter will become affected, suggesting to some people that perhaps an hereditary predisposition may be involved.

Whatever the cause may be, treatment is likely to be unsatisfactory and affected pigs are probably best dealt with by immediate slaughter in order to salvage the pork. If seen early, however, the prolapsed rectum can be washed with lukewarm weak disinfectant solution, smeared with olive or salad oil and then gently replaced. The affected pigs should then be dosed with a dessertspoonful of liquid paraffin.

Surgical treatment is often necessary, though, and in its absence recurrences need not surprise.

Ulcerative Granuloma.

In this condition, when it is well established, the skin is lost over well defined areas of the body and replaced by a flat ulcer with a hard uneven surface which is dark brownish or black in colour. The ulcers are usually roughly circular in shape. Their size varies greatly but it is not uncommon to see them up to six inches in diameter. Should the trouble occur following castration, the appearance of the resultant condition in the neighbourhood of the castration wounds is rather different. There is much swelling, often as big as a coconut and sometime almost as big as a football. These swellings break out at one or sometimes several points and pus oozes out of the openings.

Finally, in some cases there is ulceration of the inner aspects of the cheek, the gums and the tongue. This applies particularly to very young pigs.

The primary cause of ulcerative granuloma is a spirochaete. This is a form of bacterium which instead of being more or less straight has a series of waves along its length. This spirochaete is almost invariably present only in piggeries in which there is a good deal of slush and filth. Even if just a reasonable standard of hygiene is maintained no trouble need be anticipated.

So far as treatment is concerned, any swollen areas must be incised to allow of free drainage. Superficial ulcers can be dusted with tartar emetic powder and if treatment is commenced early good results can be expected.

Diarrhoea or White Scours in Piglets.

This condition usually occurs when piglets are only a few days old and is associated with overfeeding of the sow prior to and immediately after farrowing. It is also associated with sudden changes in the sow's diet and at times with unsanitary conditions. The presence of mud and slush on the sow's udder will certainly not help matters.

The prevention of scours in piglets is almost entirely a matter of correct management of the sow. For the first 24 hours after farrowing she should be given only water to drink, no food; she should then be gradually brought on to full feed, taking a week to ten days in the process.

Once the scours appear in the piglets, the sow's feed should be reduced immediately and each sucker given a teaspoonful of castor oil. One or two teaspoonsful of formalin can be added to the sow's feed twice daily in the hope that sufficient of the formalin will be excreted in her milk to have a beneficial effect on the sucklings.

Eclampsia, Tetany of Parturition, Parturient Hypocalcaemia, Milk Fever.

This rather imposing list of names refers to a condition seen in the sow at the time of or soon after farrowing. The sow is usually found lying down and obviously in great distress. She may make convulsive movements from time to time and perhaps endeavour (without success) to get on her feet. There may be muscular spasms (tetany). There is of course no appetite and the sow's milk flow is suppressed.

It is important to recognize that the condition is analogous to milk fever in cattle and is amenable to treatment along similar lines. Add ½oz.-¾oz. of calcium-boro-gluconate to 2½-3 fluid ounces of water and boil until dissolved. Allow to cool to blood heat and then administer as a hypodermic injection, using a number of different sites along either side of the sow in the process. If muscular spasms are much in evidence then it is wise to include in the injection 1 drachm (⅛ oz.) of magnesium sulphate (Epsom salts).

Spasm of the Back.

Although this condition is still uncommon it appears to be on the increase. Under Queensland conditions it seemingly is peculiar to pigs of the Large White breed and is usually seen in animals during the first month after weaning. It is a peculiar condition, to say the least. The affected pig is seen to develop quite suddenly a dip or depression in the back just behind the tops of the shoulder blades. This dip may remain in evidence without interruption for some considerable time, but more often the dip disappears and then reappears perhaps three or four times within a short space of time. Quite often the dipping of the back is accompanied or is closely followed by a spasm of the forequarters which results in the pig going down on its knees, but within a matter of seconds the animal is on its feet again apparently none the worse for its experience.

Other symptoms which have been described are a rapid stamping of a fore or hind limb, and vigorous swishing of the tail.

The cause of the condition is quite unknown at present and no suggestions can be offered on either prevention or treatment. However, affected pigs do not appear to suffer any lasting ill effects.

Arthritis.

This condition considered in its simplest form may be defined as inflammation of a joint. There is swelling of varying degree over or around a joint and some degree of heat can at times be felt with the

hand. There may be some evidence of pain if pressure is applied over the swollen area and some degree of lameness is almost invariably present, at least in the early stages.

In very young pigs the condition is usually caused by pus-forming bacteria which make their entry either by way of the unhealed navel cord or the mouth. This being the case, the importance of hygienic surroundings for young pigs is self-evident.

In older pigs, arthritis is sometimes a manifestation of more serious troubles, such as swine erysipelas or of infection with a germ known as *Haemophilus influenzae suis* (the so-called Glasser's disease). This latter condition, though still not common, has been present in Queensland since about 1937 and must be kept in mind.

Arthritis in pigs is an unsatisfactory condition to treat, and if it does not respond within a reasonable time to clean, comfortable surroundings, coupled with good feeding, then affected animals are probably best written off, if only for the reason that they are usually "poor doers."

Prevention can be materially assisted by having sows farrow in pens which have been cleaned and disinfected, dried and then provided with clean dry straw bedding.

QUEENSLAND SHOW DATES, 1948.

Barcaldine	May 12–13
Beaudesert	May 6–8
Biggenden	May 20–21
Biloela Rodeo	May 21
Biloela Show	May 19–20
Boonah Campdraft	May 27 and 29
Boonah Show	June 4–5
Bowen	June 30–July 1
Brisbane R.N.A.	August 7–14
Bundaberg	June 3–5
Cairns	July 20–22
Charleville	Abandoned
Childers	May 31–June 1
Chinchilla	May 13–15
Cooroy	August 28
Cooyar	March 5–6
Crow's Nest	May 28–29
Dalby	April 29–May 1
Dirranbandi	May 28–29
Eidsvold	May 3–4
Esk	May 14–15
Gatton	July 15–17
Gayndah	May 12–14
Gin Gin	June 7–8
Gladstone	June 10–12
Goombungee	March 20
Goomeri	May 17–19
Goondiwindi	May 1 and 3
Gympie	May 20–22
Ingham	July 16–17
Inglewood	May 7–8
Innisfail	July 30–31
Ipswich	May 11–13
Jandowae	April 26–27
Kalbar	May 29
Kilkivan	May 25–26
Kingaroy	May 6–8
Laidley	June 25–26
Lawnton	July 30–31
Lowood	June 11–12, 14
Mackay	June 22–24
Malanda	September 3–4
Marburg	May 7–8
Maryborough	May 27–29
Miles	May 19–20
Millmerran	April 9–10
Monto	April 28–29
Mount Perry	April 17
Murgon	May 20–22
Nambour	July 1–3
Nanango	April 29–May 1
Oakey	March 17–18
Pittsworth	April 6–7
Proserpine	June 25–26
Rockhampton	June 16–19
Roma	May 5–6
Rosewood	July 9–10
St. George	May 14–15
Tara	May 7–8
Taroom	May 3–5
Thangool	May 14–15
Toogoolawah	June 18–19
Toowoomba	April 17, 19–22
Townsville	July 6–8
Wallumbilla	April 30–May 1
Warrill View	May 22
Wondai	May 13–15

ANIMAL HEALTH

Blackleg.

C. R. MULHEARN, B.V.Sc., Divisional Veterinary Officer, Kingaroy.

BLACKLEG, or Black Quarter, is an infectious disease of calves and young cattle and to a lesser extent of sheep. It is very common in Queensland and occurs practically every year in the coastal and sub-coastal country from the New South Wales border to Townsville.

The incidence varies from year to year, and in some years only a small number of cases are detected, whilst in others the outbreaks are very extensive and widespread and occur almost in epidemic form. The disease is also seasonable, in that it is most prevalent during certain periods of the year, such as summer and autumn, in Southern Queensland and autumn and winter in Northern Queensland.

Animals Affected.

Calves from about 4 to 18 months old are chiefly affected with the disease, but cases also occasionally occur in young cattle up to two years old and rarely even in older animals. All classes of animals may be affected, but the biggest and strongest calves appear to be more susceptible. Often well-grown bulls are the first animals to die. As the disease usually follows beneficial seasonal conditions, most animals are in good condition when outbreaks occur.

The disease has been reported from sheep in Queensland, and young rams appear to be most susceptible. The symptoms assume a slightly different form in sheep, and the changes are chiefly confined to the head and neck.

The disease is caused by a bacillus, but it is not directly contagious from animal to animal. When a beast becomes affected the organisms multiply in certain parts of the body, and when the animal dies, as most usually do when affected with this disease, the bacilli which are present in millions through the carcass become scattered over the surrounding areas as the carcass decomposes or is broken up. The baccilli, on being exposed, form spores—that is, they become enclosed in a protective covering, and in this condition they remain highly resistant to outside agencies, such as sunlight and cold, and they continue to be infective for years. They remain in the soil, and at some subsequent period may be carried upon blades of grass or through some other agency, gain entrance to an animal's body, and cause a fresh case of the disease. It is therefore easily understood how a pasture becomes contaminated and why outbreaks of Blackleg regularly occur in certain paddocks. The more cases that occur, particularly if the carcases are not adequately disposed of, the greater will be the risk of infection in these areas in subsequent years.

Symptoms.

The bacilli must gain entrance to the calf's body before the disease can develop, and it is thought that this may happen through injuries in the legs or lower extremities or through small abrasions in the mouth,

stomach, or intestines. It is considered that the wounds on rams' heads resulting from fighting are a common means by which they gain entrance to the system in these animals.

When the causal organism enters the body it becomes established in one of the large muscle groups, such as the hindquarters, forequarters, or neck, and produces the changes which give rise to the disease.

As the disease is very sudden in onset and may kill the animal in less than twenty-four hours, it frequently happens that no symptoms are detected, an animal which is apparently healthy one day may be found dead the next. However, some animals may last up to forty-eight hours between onset of sickness and death and an occasional animal may even recover.

The symptoms consist of fever, and this is usually present in some degree before any change is noticeable in the animal. Dullness and depression become obvious, and if temperature is then taken it will be found to be several degrees above normal and may be from 104° to 106° F. Muscular tremors may also be noticeable, and when the animal is moved, pronounced lameness in either the hind or forelimbs will be evident. On closer examination a swelling will be detected in one of the groups of muscles usually in the hindquarters, but it may be along the belly or about the forequarters. This swelling may at first be small, but within a matter of hours it becomes enlarged and extensive and is very painful. At a later stage and usually just before death the skin over the swelling becomes dark and dry with a parchment-like consistency. If the swelling is manipulated it will "crackle," due to the presence of gas and fluid in the underlying tissues. On being opened (an unwise procedure) a dark, frothy, sour-smelling liquid will drain away.

Following the early symptoms the animal discontinues feeding, shows dullness, rapid breathing followed by exhaustion, loss of consciousness, and death, with little or no signs of struggling. Death is actually caused by the circulation through the system of poisonous substances (Toxins) produced by the bacilli within the swelling described above.

Post-mortem Findings.

The post-mortem findings are important in connection with the diagnosis, as it frequently happens that the animals are found dead without showing symptoms, and an immediate diagnosis is desirable in order that the necessary preventive measures can be undertaken. As the disease usually occurs when putrefaction sets in rapidly, one finds the affected carcass to be badly "blown" within a few hours of death, due to the formation of gas under the skin. This causes the legs on the upper side of the carcass to extend straight out. However, if the body is closely examined it is possible to find the seat of the trouble in the form of a swelling which crepitates or "crackles" under pressure of the hand. This crackling is quite distinctive and is not found in other parts of the body. If this area is opened it will be found to contain a dirty, blackish, frothy fluid mixed through the tissues. The muscles are also much darker than normal, and the whole area is not unlike a bad bruise. There is a distinctive smell in this lesion which is quite different from the smell of an ordinary decomposing carcass and which has been described as resembling rancid butter. The presence of these changes in the carcass of an animal under two years is sufficient to warrant a diagnosis of blackleg and to institute immediate preventive

measures. It is not wise to open up the carcass, as the body discharges become scattered, and with them the organisms, which may give rise to outbreaks of the disease in later years. However, should the body of a recently dead animal be opened up, one usually finds up to half a gallon of blood-stained fluid in the abdominal cavity and the liver and kidneys are congested and swollen.

Prevention and Control.

The opportunities for treatment are rare, but if the occasion arises the sick animal should be held in the shade and given ample supplies of water to which potassium nitrate (nitre) has been added at the rate of 1 oz. per 4 gallons. Valuable animals, such as stud bulls, could be also treated with penicillin. The old adage that "prevention is better than cure" cannot be too strongly stressed in this disease, and preventive measures consist of minimizing the risk of animals becoming exposed to infection and immunizing susceptible animals so that they will be resistant to the disease.

As already pointed out, the bacilli responsible for blackleg multiply in enormous numbers within the diseased animal's body and are scattered in a very resistant form when the carcass is opened up. These organisms may live for years in the soil and be responsible for fresh outbreaks of the disease. Unless action is taken to adequately dispose of the unopened carcasses, the soil and pastures in the vicinity become grossly contaminated with the infection and outbreaks of the disease regularly occur, and the area becomes more heavily charged with infection each year until it becomes recognised as a "hot bed" of the disease.

The best method of destruction of carcasses is by burning, and after a diagnosis has been established wherever possible this action should be taken. The carcass should be moved as little as possible, and it should not be opened, as the body discharges will scatter the germs. If burning is not possible, deep burial and thorough disinfection are recommended.

In areas where the disease regularly occurs, preventive inoculation of all young cattle should be undertaken each year. The inoculation should be carried out prior to the anticipated time of the outbreaks, such as in the spring in Southern Queensland and in the autumn in Northern Queensland. Some owners, particularly in areas where the disease is not so prevalent, prefer to wait until a case is detected before they go to the expense of inoculation, as the outbreaks may be spaced years apart. The decision as to whether regular yearly or intermittent inoculations are carried out will depend on the history of the disease in the individual area.

There are several vaccines on the market both in a liquid and solid form, and the liquid vaccine prepared by the Commonwealth Serum Laboratories has been extensively used by the writer with successful results. This vaccine is injected under the skin by means of a syringe, and it produces an immunity within about fourteen days. The immunized animals usually remain resistant until they pass the age at which they are susceptible to the disease, but it may sometimes be advisable, particularly during a year when outbreaks are extensive, to reinoculate the calves when they are about eighteen months old. The second inoculation will minimize the risk of loss and give a lasting immunity.

MARKETING

Production Trends, January.

Dairy production reached its peak for the season during the first half of January, but the drying off of mature forage crops in some districts caused a slight decline in production towards the end of the month.

Potato deliveries from the 1947 spring crop up to the end of January were approximately 18,000 tons, and the total crop will probably reach 19,000 tons.

The total quantity of wheat bagged for the season, including wheat retained by growers for seed and feed purposes, will exceed 10,500,000 bushels.

Plantings of grain sorghum on the Darling Downs are much lighter than last year. Fair to good yields are expected from early crops. Reports indicate that later sowings are particularly light.

Hot dry conditions in the main cotton growing districts have caused severe checking of plant growth in the earlier crops, and good soaking rain is required.

The Southern Queensland pineapple crop will reach its peak during February, but heavy supplies will continue until the end of March.

Receivals of eggs by the South Queensland Egg Marketing Board for January were 682,113 dozen, compared with 606,105 dozen for January, 1947.

Potato Marketing Board.

The recently elected Potato Marketing Board held its inaugural meeting in the Department of Agriculture and Stock on the 22nd and 23rd January, 1948. The Board is comprised of five representatievs of the growers, one from North Queensland, one from Central Queensland, and three from South Quensland, and the Director of Marketing. The grower members are Messrs. T. J. Ford, College road, Gatton (Chairman), C. F. Giffard, Home Hill, M. W. Reeves, Imbil, J. J. Dwyer, Gap View, via Kalbar, and W. Utz, Mt. Tarampa, via Coominya.

The marketing of potatoes will be continued by the Commonwealth Government under the National Security (Potatoes) Regulations until 31st October, so that the new Board will not be called upon to implement its marketing policy until 1st November, that is to say, it will be required to market the 1948 spring crop.

However, in the intervening months, the Board will be required to frame its marketing policy generally, and in particular will require to consider the question of Interstate trade in potatoes. Preliminary discussions on this matter will take place at a Potato Conference in Adelaide on 25th February at which the Queensland Board will be represented by Messrs. T. J. Ford and J. J. Dwyer and the other States will each have two representatievs.

Consumption of Fresh Milk.

The significance of modern trends towards correcting nutritional deficiencies and their effect on the pattern of consumption of primary commodities is emphasized by an examination of current trends in fresh-milk consumption in many countries of the world. The joint effect of improved methods of handling and distributing milk and of the publicity given to the need to enhance standards of nutrition is illustrated most aptly by the statistical data furnished below which gives some indication of the increased consumption of milk in this country and certain overseas countries.

Such a world-wide increase in fresh-milk consumption cannot but have a marked influence on the supplies of butter available, and it does represent one important factor which will tend towards continued shortages of this commodity unless a considerable development of dairy production can be encouraged.

Queensland.

In the city of Brisbane supplies of Brisbane Milk Board-controlled milk for consumption in the city area increased from 4,569,607 gallons in 1940-41 to 10,929,807 gallons in 1946-47, whilst throughout Queensland over 14,000,000 gallons more were consumed in 1945-46 as milk and ice cream than during 1940-41.

Australia.

The following table extracted from Dairying Industry Statistics published by the Commonwealth Bureau of Census and Statistics shows the increase in consumption in Australia of fresh milk which occurred between 1940-41 and 1946-47:—

Year.	Million Gallons.
1940-41	176
1946-47 *	229

*Subject to revision.

United Kingdom.

The following information has been extracted from the chairman's report to the annual meeting of the United Kingdom Milk Marketing Board:—

> "Milk production in the United Kingdom during 1946 exceeded all previous records, amounting to 1,275,000,000 gallons, which is an increase of 38,000,000 gallons on the previous year. Ninety per cent. of the milk production was sold as liquid milk, the demand for which is still considerably in excess of supplies. The unsatisfied consumer demand is something like 150,000,000 gallons."

U.S.A.

The following data, extracted from Agricultural Statistics of the United States Department of Agriculture, 1946, shows the increase in consumption of fluid milk in that country during the war years:—

—	1941.	1945.*
	Million Gallons.	Million Gallons.
Consumed as fluid milk or cream—		
In cities and villages ..	4,054	5,433
On farms where produced ..	1,400	1,361
Total	5,454	6,794

*Preliminary.

Ontario, Canada.

Figures showing commercial sales of fluid milk in the Province of Ontario, Canada, on a 30-day month basis, show that sales have increased from 8,213,750 gallons for April, 1944, to 8,971,375 gallons for July, 1947.

South Africa.

The Union of South Africa is another country in which milk consumption has increased. The following statement, made by the Hon. J. G. N. Strauss, Minister of Agriculture, is an extract from a report of the High Commissioner for Australia at Capetown on 13th May, 1947:—

> "Even under the existing unfavourable circumstances, milk production had actually increased, but there had also been an enormous increase in fresh-milk consumption."

GENERAL NOTES

Staff Changes and Appointments.

Mr. L. G. Newton, Q.D.A., B.V.Sc., Veterinary Officer stationed at Oonoonba, has been appointed Officer in Charge of the Department of Agriculture and Stock's Animal Health Station at Oonoonba, near Townsville.

Notice of Intention to extend Barley Marketing Board.

An Order in Council has been issued under *The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1946, giving notice of intention to extend the operations of The Barley Marketing Board for a further period of six years from 24th April, 1948. Nominations have been invited for the election of two growers' representatives on the Board for a period of three years from 24th April next.

Marketing Reporting Services.

The activities of the Marketing Reporting Service of the Department, which was inaugurated for the purpose of providing primary producers and others interested with authentic daily reports of wholesale prices and market conditions for primary produce, has been extended to cover daily reports of sales of farm produce at the Roma Street Railway Goods Yard.

These reports are now included in the Daily Official Market Quotations, which cover also the Brisbane Wholesale Fruit and Vegetable Markets.

Dairy Technology Scholarships.

The Department of Agriculture and Stock announced recently its intention to grant scholarships in dairy technology as from the commencement of the 1948 New Zealand university year to selected Queensland University students with the necessary qualifications. Scholarships in dairy technology have been allotted to Messrs. W. D. Mitchell, a cadet in the Dairy Research Laboratory of the Department, and T. A. Morris (Mitchelton). These young men will attend the Massey Agricultural College School of Agriculture, University of New Zealand, for a period of three years.

The Dairy Products Stabilisation Board.

An Order in Council has been issued under *The Dairy Products Stabilisation Acts* constituting the Seventh Dairy Products Stabilisation Board for a period of three years from 1st February, 1948, and appointing the members of the Butter and Cheese Marketing Boards and the Director of Marketing to be members of such Board.

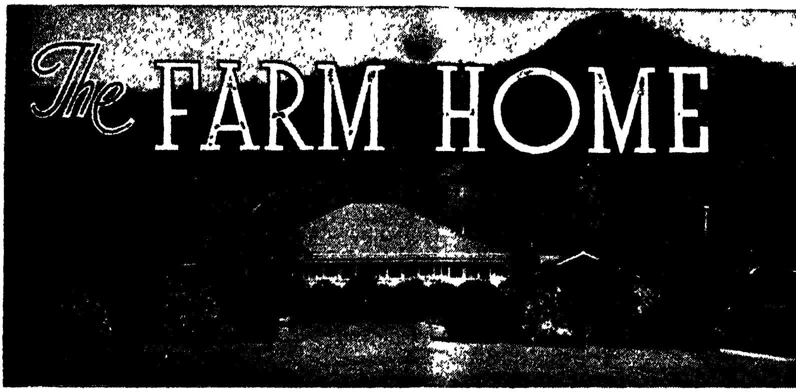
The members are: Messrs. A. H. Bulow (Mulgilde), O. O. Madsen, M.L.A. (Yangan), A. G. Muller, M.L.A. (Boonah), J. McRobert (Maryborough), T. F. Plunkett, M.L.A. (Beaudesert), and J. Purcell (Toowoomba), representatives of the Butter Marketing Board; Messrs. R. C. Duncan (Toowoomba), D. G. O'Shea (Southbrook), M. McIntyre, M.L.A. (Mount Tyson), representatives of the Cheese Marketing Board, and Mr. H. S. Hunter (Director of Marketing).

Fauna Sanctuary.

An Order in Council has been issued under *The Fauna Protection Act of* 1937 declaring an area embracing the Alliance and Ibis dams at the State Treatment Works, Irvinebank, as a sanctuary for fauna. Mr. C. C. Wyatt, mill foreman at Irvinebank, has been appointed an Honorary Fauna Protector.

Extending Pineapple Levy Regulation.

The Pineapple Levy Regulation under *The Fruit Marketing Organisation Acts* has been extended for a further period until the 31st December, 1948. An amendment of the Regulation provides for an additional levy at the rate of sixpence (6d.) per case on all pineapples purchased by the Committee of Direction of Fruit Marketing from farm produce agents for supplying to fruit canners.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

TRAINING A CHILD TO EAT.

A CHILD wants to repeat the things that give him pleasure and satisfaction, therefore to help baby form good eating habits we must see that he gets satisfaction out of doing the things we want him to do.

The change from breast to bottle feeding is a big step for the baby in growing up. Later steps will be easier if the baby finds this one pleasant. All changes in feeding must therefore be gradual, as sudden changes are likely to be resisted.

When the baby gets his first taste of cereal or other solid food he is starting a new experience. Mother would like him to enjoy it so that he wants to repeat it. Up to this time he has taken his food in liquid form and he knows of only one way of satisfying his appetite, namely, sucking, from which he gets great satisfaction. When a small amount of solid food is put into his mouth he does not know what to do with it and he may at first spit it out for this reason. If he keeps it in his mouth you can see him feeling it with his tongue, turning it over, finding out for himself what it is. If now you will encourage him by looking pleased and speaking of the "nice breakfast" you will let him see that you are pleased with the attempt. If he then pushes it out with his tongue give him another small portion to try again. Do not laugh at his funny faces—treat the situation as a serious but pleasant lesson in eating and always praise him for trying. He will thus learn to associate eating with pleasant words and looks from mummy.

Take it for granted that he will like every new food, and offer it to him in small amounts each day until he eats it well. Never ask a child whether he likes a food and above all do not sugest to him by the expression of your face or any other way that he may not like it. Quite a little baby will understand your attitude even if he does not understand your words. Good, well-cooked food and pleasant surroundings are necessary for the greatest pleasure in eating but it must not be forgotten that even more important is the need for being hungry at meal times. So do not give children biscuits, sweets or indeed anything except fruit or fruit juice between meals.

Many children learn quickly and well to eat new foods, others more slowly. Do not be anxious or worried if your child is slow in learning or if he refuses to eat. If you are, the child will know it and will soon learn to get extra attention by continuing to refuse. All children like attention so give them approval when they eat well but ignore them when they refuse to eat. In this case just take the food away without showing any excitement and offer it again at the next meal time. Do not talk about the child's refusal to eat in front of him or allow yourself or other members of the family to express their dislike for certain foods in his presence. Children are great copyists. Do not force or coax your child to eat.

When a baby sees his mother using a spoon to feed him he may wish to use one also. Let him have a spoon even if he is messy. The joy that a child gets out of directing a bit of cereal into his mouth with a spoon or even with his hands is taking the place of the joy he used to have in sucking. A child likes to hold his cup also. Steady it for him and let him do as much as he can.

A child will learn to like all the foods that are good for him if they are given to him in such a way that he gets satisfaction out of eating them. He will not cry for foods he has never tasted so do not let him taste foods you know are bad for him.

Mothers should learn all about the foods that build up strong healthy bones and muscles and create resistance to illnesses. Ask Sister at your Welfare Centre to explain them to you.

Any other advice on this and other matters connected with children may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

Some Appetising Salads.

Mixcd Salad.

One pound of cold new potatoes, ¾ pint cold peas, any fruit available, lettuce, vinegar, seasoning mayonnaise, paprika pepper. Slice potatoes; sprinkle with 1 tablespoon seasoned vinegar, leave to marinate for 10 to 12 minutes. Add peas and fruit, and mix. Bind with mayonnaise. Line salad bowl with washed and well dried lettuce leaves, fill in salad, top with lightly sprinkled paprika.

Salad Dressing.

To make quick mayonnaise place in the maker in the following order: One cup of lemon juice, one cup of melted butter or oil, one tin of condensed milk, one unbeaten egg, one teaspoon of salt, a little pepper and a tablespoon of made mustard. Beat together rapidly until light and frothy like whipped cream, when it is ready for use. This is a savoury dressing; if a sweet one is desired omit the salt, pepper and mustard and add a little sugar if desired.

Salad Ring Mould.

Half pint mixed cold peas, diced carrot and potato, ½ pint thick custard, seasoning, vinegar, mustard, pinch of sugar, ½ oz. gelatine, watercress and radishes. Make custard with half as much as usually used for sweets, and do not sweeten. Add to the hot custard the gelatine previously softened with 2 tablespoons water, stir till dissolved. Leave till just setting. Season with about 1 teaspoon salt, pepper, ½ level teaspoon sugar, 1 level teaspoon dry mustard mixed with 1 dessertspoon vinegar; stir in 2 to 2½ dessertspoons more vinegar. Mix in vegetables. Fill into a 1-pint wetted border mould, leave to set. Unmould, fill centre of ring with watercress; trim dish with watercress and radishes. Enough for 4 to 5 people.

Sweet and Sour.

For each person allow about 2 tablespoons shredded raw cabbage, and an equal quantity of grated raw carrot. Moisten cabbage with salad cream or seasoned vinegar, place in centre of dish, surround with carrot. Top with sliced tomato. Just before serving, strew with chopped raw cauliflower head (delicious nutty taste) and sprinkle with sugar if desired.

"Poinsettia" Salad.

Wipe firm, round, large tomatoes, 1 to 2 per person. Cut off thin slice from blossom end, scoop out pips. Cut flesh from top to bottom into sections, but do not slice all the way through; turn back to form petals. Insert slice of cucumber in each cut; fill centre with chopped hard boiled egg. Top with mayonnaise, sprinkle with chopped parsley. Serve on lettuce leaves.

Salad in Jelly.

Mixture: One tablespoon gelatine, ¼ cup cold water, 1 cup boiling water, ¼ cup sugar, ¼ cup vinegar, 2 tablespoons lemon juice, 1 teaspoon salt. Prepared vegetables: One cup shredded celery, ½ cup shredded cabbage, ½ cup peas, ¼ cup cooked beetroot, ½ cup shredded carrot, lettuce. Salad dressing, fine cress. Put gelatine mixture in a pan. Dissolve and allow to cool. Add prepared vegetables. Mould in either large or individual moulds. Garnish with salad and some salad dressing.

QUEENSLAND WEATHER IN JANUARY.

District rainfall averages were mostly well below normal, except for the flood areas of the Far North Coast (Barron and Herbert). Some heavy totals were also reported from parts of the Peninsula, Gulf Country and east Carpentaria during the northern cyclonic rain depression operating between the 10th and 14th.

Although there were scattered coastal showers late in the month and scattered thunderstorms in the South Moreton district 13th/14th, there was very little rain over most of the State, apart from variable thunderstorm falls 2nd/3rd in most districts. These falls included a fair percentage of useful over one inch totals in the central and southern interior. Most of the pastoral and agricultural areas of the State are still in good condition following the record spring rains, but, with the gradual decrease in distribution during December and January, a good soaking monsoonal rain during February and March would be very beneficial.

Pressure.—An inland trough and cold southerly front brought the State-wide distribution of variable thunderstorms from the 1st—3rd. By the 5th and 6th increased tropical activity was shown in the shallow depression area from the Gulf of Carpentaria to the North Coral Sea, and on the latter day a small but intense cyclonic centre moved over Thursday Island at midday causing structural damage By the 8th the depression had moved south-east to about 100 miles east-north-east from Cooktown, losing wind energy but becoming a heavy rain depression which brought much flooding in the adjacent coastal area Cooktown to Cardwell during the weekend 10th/12th. At the same time another depression around the south-eastern corner of the Gulf of Carpentaria brought heavy local rains. With the centre south of Normanton on the 13th rains continued during the 14th as the centre moved over-night to the east-north-east of Townsville. By the 15th the centre was 300 miles east of Mackay and it continued its south-east movement to the south of New Caledonia, holding up aircraft movement from that place. During the latter half of the month a more or less permanent high pressure ridge along the coast and a weak dip formation inland were the main controls, but cyclonic conditions to the west of the New Hebrides developed considerable intensity and moved slowly southward west of New Caledonia to a deep centre east of Lord Howe Island on the 31st. Strong south to south-east winds and rather rough weather were maintained on the Queensland coast during this period. On the 8th, 9th, 10th there was also rough south-east weather south from Townsville which gradually moderated by the 14th, except for erratic squalls accompanying the rain cyclone. 13th—Small but sharp tornadic squall Sandgate (metropolitan).

Some heavy monthly flood rain totals included 1412 points Croydon, 1813 Karumba, 1186 Normanton, while along the north coast many 20/30 inch amounts were recorded—4019 points Babinda, 4458 Innisfail, 5252 Tully (second highest January record).

Temperature.—One of the coolest Januarys on record. Maximum temperatures averaged 1 to 2 deg. below normal up to 3.5 deg at Thargomindah Minimum readings ranged from 1 deg. below at Palmerville to 4 2 deg. and 6 2 deg. below at Thargomindah and Mitchell. During the latter half of the month inland temperatures became warmer, with 19 days over 100 deg. at Boulia and 18 at Camooweal. Highest maximum 110 deg. on 29th and 30th at Camooweal and Urandangie.

Brisbane.—Mean pressure $\frac{9 + 3}{2}$ 29.905 ins. (normal 29.809 ins.). *Temperature.*—Coolest January on record. Mean maximum 81.8 deg. (normal 85.4 deg.); (third lowest on record). Mean minimum 65 7 deg. (normal 69.1 deg.); (lowest on record). Mean temperature 73.7 deg. (normal 77.3 deg.); (lowest on record). Rainfall 478 points on 11 days (average 634 points on 13 days). Sunshine 277.0 hours (normal 234.8 hours).

The rain position is summarised below—

Division.	Normal Mean.	Mean January. 1948.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	1389	880	37 below
Peninsula South	935	777	17 ,,
Lower Carpentaria	725	567	22 ,,
Upper Carpentaria	628	424	32 ,,
North Coast, Barron	1328	1802	36 above
North Coast, Herbert	1411	2120	50 above
Central Coast, East	893	329	63 below
Central Coast, West	537	207	61 ,,
Central Highlands	400	62	85 ,,
Central Lowlands	321	105	67 ,,
Upper Western	316	69	78 ,,
Lower Western	170	3	98 ,,
South Coast, Port Curtis	658	175	73 ,,
South Coast, Moreton	671	392	42 ,,
Darling Downs, East	375	179	52 ,,
Darling Downs, West	298	153	49 ,,
Maranoa	302	115	62 ,,
Warrego	214	158	26 ,,
Far South-West	191	148	23 ,,

Commonwealth of Australia Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

MARCH.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.41	6.20	Cairns	31	27	Longreach	36	34
6	5.44	6.15	Charleville ..	27	27	Quilpie	35	35
11	5.46	6.10	Cloncurry	51	48	Rockhampton ..	10	10
16	5.49	6.04	Cunnamulla ..	29	29	Roma	17	17
21	5.52	5.59	Dirranbandi ..	19	19	Townsville ..	25	23
26	5.54	5.53	Emerald	19	19	Winton	41	39
31	5.57	5.48	Hughenden ..	35	33	Warwick	4	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Day.	Rise.	Set.
	p.m.	a.m.
1	10.05	11.07
		p.m.
2	10.47	12.07
3	11.32	1.06
4	..	2.02
	a.m.	
5	12.21	2.54
6	1.14	3.41
7	2.08	4.28
8	3.03	5.00
9	3.58	5.33
10	4.52	6.04
11	5.46	6.34
12	6.39	7.02
13	7.33	7.31
14	8.28	8.02
15	9.25	8.37
16	10.25	9.16
17	11.28	10.01
	p.m.	
18	12.32	10.54
19	1.35	11.54
20	2.33	..
		a.m.
21	3.27	1.00
22	4.14	2.10
23	4.56	3.20
24	5.34	4.29
25	6.10	5.36
26	6.45	6.41
27	7.20	7.45
28	7.58	8.50
29	8.39	9.52
30	9.24	10.54
31	10.13	11.53

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	27	13	43	28	18	3	50	31
6	30	10	46	24	21	0	58	27
11	22	17	38	33	13	8	44	37
16	12	27	27	43	2	18	30	51
21	11	29	26	44	0	20	28	52
26	22	18	38	33	13	9	43	38
31	30	9	46	24	21	0	53	26

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	47	12	63	38	47	24	39	12
3	54	5	67	34	51	20	44	6
5	55	3	68	32	51	18	45	4
7	53	7	67	35	50	21	44	8
9	45	14	61	40	46	25	37	14
11	36	24	55	46	40	32	30	21
13	26	34	47	54	32	39	22	29
15	16	44	41	60	26	46	14	37
17	7	52	36	65	20	50	7	44
19	3	55	34	67	18	52	4	45
21	7	52	36	65	20	50	7	44
23	18	43	42	59	27	45	16	36
25	29	31	50	52	35	37	25	27
27	41	20	57	44	42	29	34	18
29	51	9	65	36	49	22	42	9
31	55	3	68	32	51	18	45	4

Phases of the Moon.—Last Quarter, March 3rd, 2.35 a.m.; New Moon, March 11th, 9.15 a.m.; First Quarter, March 18th, 10.27 p.m.; Full Moon, March 25th, 1.10 p.m.

Equinox, March 21st.—At 2.57 a.m. on March 21st the Sun will cross the Equator, and it will then rise and set at true east and true west respectively. On March 12th and 25th the Moon will rise and set respectively at true east and true west.

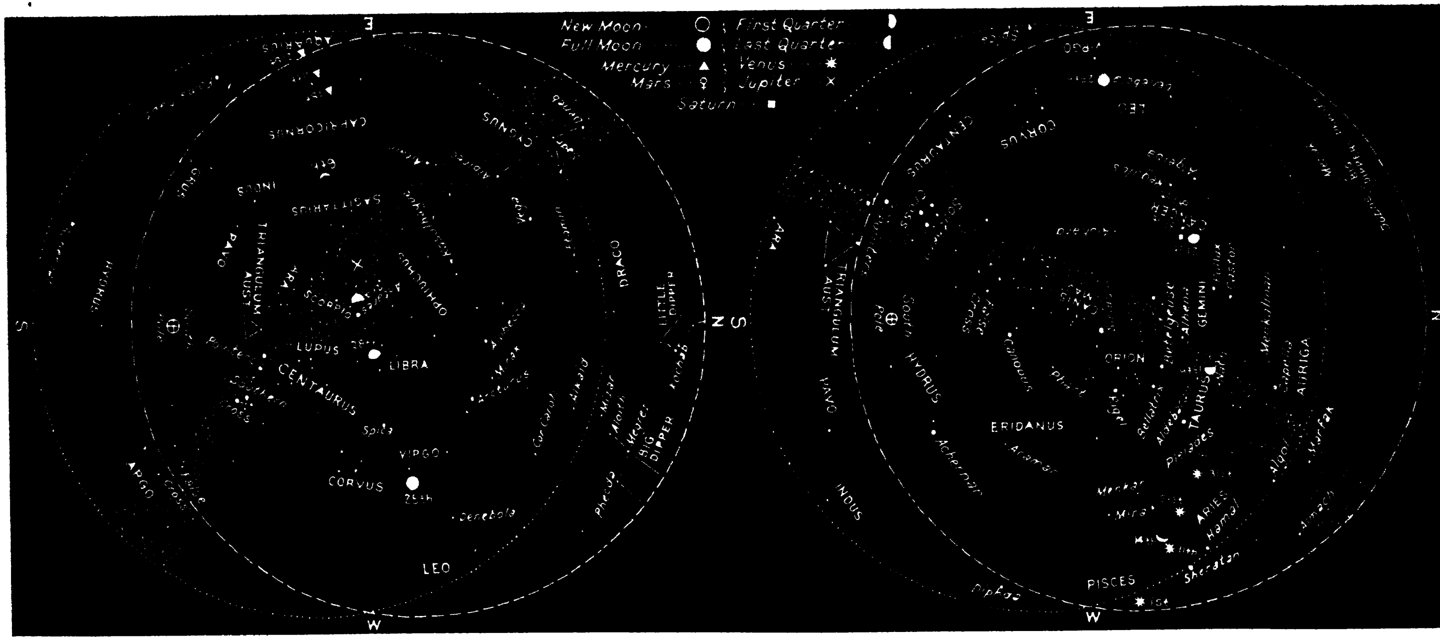
Mercury.—Favourably placed as a morning object all this month in the constellation of Aquarius. On the 1st it will rise 1 hour 21 minutes before the Sun, and on the 17th will reach its greatest angle west of the Sun, when it will rise over 2 hours before sunrise. On the 31st it will rise 1 hour 50 minutes before the Sun.

Venus.—In the constellation of Pisces will set 1 hour 56 minutes after sunset on the 31st, and after passing 10 degrees south of Hamel on the 11th, on the 31st, in the constellation of Aries, will set 2 hours 11 minutes after the Sun.

Mars.—Now rising during the afternoon and is visible almost all night. On the 7th will be about midway between Regulus and Saturn. By the 31st it will have almost caught up to Saturn, when it will set about 2 hours after midnight.

Jupiter.—In the constellation of Sagittarius, will rise about midnight on the 1st, and between 10.15 p.m. and 11.30 p.m. on the 31st.

Saturn.—On the 1st will rise half an hour before Mars, and on the 31st on the boundary between Leo and Cancer, and about 1 degree south of Mars will set about 2 hours after midnight, 8 minutes before Mars.



Star Charts.—The chart on the right is for 7 15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th March. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 9 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west arrive at any selected position about 4 minutes earlier each night Thus at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th, and at the end of the month about one hour earlier than that time. The positions of the moon and planets which are continually changing in relation to the stars are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JANUARY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of years' re-cords.	Jan., 1947.	Jan., 1948.
North Coast.	In.		In.	In.
Atherton	11·52	42	4·42	12·00
Cairns	16·43	61	3·63	27·74
Cardwell	16·99	71	0·22	33·15
Cooktown	14·10	67	1·31	18·44
Herberton	9·31	57	2·37	7·89
Ingham	15·96	51	1·42	17·06
Innisfail	20·24	62	0·81	44·58
Mossman	18·87	19	5·32	28·50
Townsville	11·05	72	0·35	8·75
Central Coast.				
Ayr	10·95	56	0·51	4·14
Bowen	9·65	72	0·19	6·77
Charters Towers	5·35	61	1·29	2·17
Mackay	13·50	72	1·66	4·42
Proserpine	14·95	40	2·02	11·56
St. Lawrence	8·93	72	0·82	1·31
South Coast.				
Biggenden	5·25	44	1·97	1·15
Bundaberg	8·52	60	3·29	2·94
Brisbane Bureau	6·38	95	11·91	4·78
Caboolture	7·96	67	9·92	5·45
Childers	7·23	48	5·46	2·13
Crohamhurst	11·78	50	7·87	5·62
Esk	5·64	56	6·92	1·70
South Coast—cont.	In.		In.	In.
Gatton College	4·32	44	5·17	1·17
Gayndah	4·70	72	1·64	0·55
Gympie	6·57	73	3·71	2·40
Kilkivan	5·63	62	1·63	0·65
Maryborough	6·97	72	6·25	3·42
Nambour	9·37	47	7·25	5·54
Nanango	4·65	61	2·00	0·99
Rockhampton	7·39	72	0·42	0·87
Woodford	7·72	55	6·03	3·63
Central Highlands.				
Clermont	5·02	47	2·63	0·53
Springsure	4·21	74	1·71	0·35
Darling Downs.				
Dalby	3·44	78	4·61	0·98
Emu Vale	3·22	47	3·84	1·78
Jimbour	3·51	64	3·12	0·72
Miles	3·83	58	2·23	0·83
Stanthorpe	3·68	70	6·61	2·20
Toowoomba	5·16	71	7·20	1·40
Warwick	3·58	78	5·55	2·20
Maranoa.				
Roma	3·20	69	2·18	1·11
St. George	2·64	62	0·24	1·55

CLIMATOLOGICAL DATA FOR JANUARY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	87	73	92	30	68	16	2774	22
Herberton	..	81	63	88	18	53	16	789	19
Townsville	..	88	74	94	3	68	14	875	14
Rockhampton	29·86	90	69	98	29	66	3	87	6
Brisbane	29·93	82	70	88	30	62	10	478	11
Darling Downs.									
Dalby	..	86	60	95	31	51	17	98	3
Stanthorpe	..	77	54	85	31	45	17	220	9
Toowoomba	..	80	58	89	31	52	30	140	7
Mid-Interior.									
Georgetown	29·81	92	71	98	27	60	16	709	8
Longreach	29·85	98	70	108	31	61	4, 15	93	3
Mitchell	29·89	90	61	100	29	50	16	108	4
Western.									
Burketown	..	95	74	105	9	66	16	584	6
Boulia	29·81	101	73	109	21, 29	60	4	4	1
Thargomindah	29·86	94	70	106	21, 29	59	2, 3	94	4

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Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

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Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Arts, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**

Volume 66 | 1 MARCH, 1948 | Part 3

Event and Comment.

Extension of Veterinary Services.

ADDITIONAL veterinary services to Queensland stockowners are provided for in the *Diseases in Stock Acts Amendment Bill* introduced by the Minister for Agriculture and Stock, Hon. H. H. Collins, and now before the State Parliament.

In the course of his speech on the initiation of the measure in committee, the Minister said that its principal objectives were to increase facilities for testing dairy stock for tuberculosis and to make veterinary services more readily available. Fewness of qualified veterinarians for recruitment to his Department had retarded its tuberculosis testing programme. Many qualified men preferred private practice and it was proposed to offer an inducement to them to engage in this work and so accelerate the testing of dairy herds. It was intended to allot certain districts to private practitioners, giving them the sole right of testing for tuberculosis in dairy herds in those districts which are supplying milk to the metropolitan area. The veterinarians would contract with the Government to test all the dairy cattle in their respective districts at a prescribed fee of so much a head. The scheme would allow Government veterinary officers to give a better service to the stockowners of the State generally, in that so many of them would not be tied up testing for tuberculosis in dairy cattle. The areas in which the veterinarians engaged in private practice would operate would be defined in their respective contracts, but it would not necessarily follow that their private practice would be confined to those districts. The purpose was to define certain areas of operation for each, so that with their private

practice they would be assured of a reasonable living and thus become permanent residents as veterinarians in those areas.

Continuing, Mr. Collins said that for some time the Government had been concerned with the comparatively small number of veterinary surgeons in the State, to such an extent that enquiries had been made in other countries with a view to bringing qualified men from Great Britain, Europe or America. A conference had been held in Melbourne recently, consequent on discussions at the last meeting of the Australian Agricultural Council in Canberra, for the purpose of considering the desirability of inducing veterinary surgeons from other countries to set up practice in Australia. As a result of investigation it was found that some universities in the United States had qualifying examinations in veterinary science of a standard equal to that of the University of Sydney, the only institution in Australasia which provided for a full degree course. The University of Sydney was investigating what universities of other countries had equivalent veterinary school standards, and whether there was any reasonable system under which veterinary surgeons could come from other countries to set up practice here. Precautions would naturally be taken to protect those already engaged in the profession here and to protect the stockowner as well from the risk of services from men not fully qualified in veterinary science.

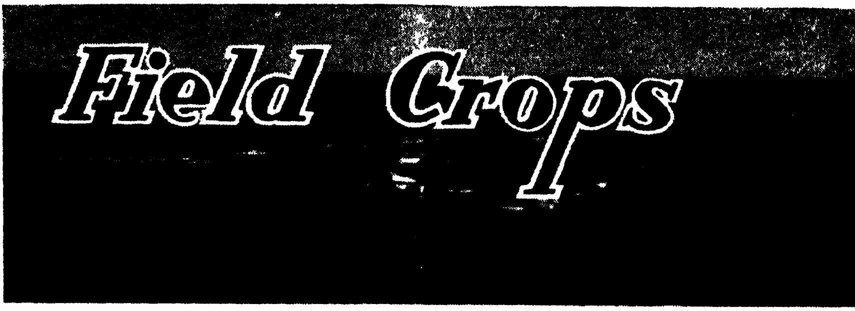
Concluding, the Minister said that he looked forward to the time when all the dairy herds of the State could be certified as free not only from tuberculosis, but from any other form of animal disease communicable to man. The Bill would help in the attainment of that laudable objective.

Vaccination Against Brucellosis.

LAST year more than 8,000 calves were vaccinated with Strain 19 as a protective measure against brucellosis (contagious abortion) and the first of the treated animals are now calving normally, as stated in a recent announcement by the Department of Agriculture and Stock. Heifers unmated under the age of 12 months may be vaccinated by veterinary practitioners or by veterinary officers of the Department. To facilitate vaccinations and to ensure economy farmers are advised to organize groups within their districts so that a maximum number of young stock may be treated with a minimum of travelling. It is preferable to arrange for the animals to be brought to a central place for treatment; if this is not practicable a definite itinerary for visits from farm to farm should be prepared. Arrangements along these lines have been made satisfactorily in the Beaudesert, Conondale, Maleny and Atherton districts. Branches of the Queensland Dairymen's Organization should contact local veterinary officers or inspectors of stock to arrange for this vaccination service.

Unit Herd Testing.

IN a recent Press statement Mr. Collins commended the interest and enthusiasm displayed by the dairy farmers of Maleny in the herd testing unit which commenced operations in that district early in February. The formation of a second unit is now contemplated. A departmental herd tester is visiting farms regularly for the purpose of weighing, sampling and testing the milk of individual cows in the respective herds. There are 25 farmers in the unit already established with an aggregate of 1,000 cows and the first round of testing is proceeding according to plan.



Linseed Growing.

C. S. CLYDESDALE, Senior Adviser in Agriculture, and S. G. BURNS, Assistant Agronomist.

FLAX fibre and linseed are two products of the flax* plant, of which there are two distinct types, one producing high yields of fine-quality fibre and the other high yields of flaxseed—the linseed of commerce. Both of these types are grown in Australia at the present time and, while most development has occurred in the southern States, trial plots indicate that the linseed type at least can be grown in Queensland.

From the grower's point of view linseed must be regarded as a cash crop, as the seed is not consumed on the farm where it is produced. The grower must, therefore, decide whether the returns from linseed justify the use of land for this crop, or whether the land would be more satisfactorily employed growing something else—wheat, for example. The decision depends, of course, on the prevailing price of linseed, the expected yield, the price of wheat and the grower's own summing up of all the facts concerned.

Linseed may be used in the normal crop rotation and the husbandry of the crop differs but little from that of wheat. The machinery used for cultivating, sowing and harvesting wheat may be used with slight modification for producing a crop of linseed. Thus, the prospective grower with experience of wheat production, if he has wheat machinery available, may turn his hand with some measure of confidence to the growing of linseed.

General Climatic Requirements.

The mild and humid areas of the world have been found most satisfactory for this crop. However, United States experience has been that satisfactory yields of good quality linseed are possible in the hotter regions with even a poor rainfall distribution, provided care is taken in the selection of the variety and in the methods used for preparing the seed-bed. Trials in southern Queensland to date indicate that the same may apply here. The rainfall during the growing season (May to November on the Darling Downs) is of great value to the crop, but in this type of climate it is the conserved moisture that is of first importance.

* *Linum usitatissimum.*

Soils.

The soil requirements of linseed are not as exacting as the climatic requirements. Practically any agricultural soil that shows no tendency to water-logging and is not sheltered or in a hollow is suitable for linseed production. Sheltered and low areas are unsuitable because their higher atmospheric humidity encourages rust development. Perhaps the best soil types are well-drained dark or chocolate loams, rich in organic matter.

Preparation of the Seed-bed.

Linseed is best grown on land that has been previously worked for another crop. Freshly broken land may be used, but the subsequent crop is as a rule a very poor one. However, no matter what the initial condition of the land, it must be given a long fallow if the linseed crop is to be worth while. The fallow period promotes the increase of sub-surface moisture and provides opportunities for the destruction of weed growth by cultivation.

A few words might be said to emphasize the effects of weeds and weed growth on the linseed crop. Linseed has a shallow root system and does not produce a great abundance of stem and leaf. Thus it is at a disadvantage when it comes into competition wtih vigorous weeds for available soil moisture and growing space. Such competition may result in crop failure and, even if a crop is produced, heavy weed growth makes harvesting difficult and reduces the value of the crop.

Thorough and correct preparation of the seed-bed will go a long way towards eliminating the weed menace, but the importance of the long fallow period, early seed-bed preparation and early sowing must not be overlooked. The farmer who has recognized and employed all the practices outlined herein can be certain that he has done all in his power to ensure success.

The general methods and implements for seed-bed preparation as used for wheat or oats are considered satisfactory for linseed. The fallow may be started at the same time as for wheat and the depth of ploughing and subsequent cultivations are essentially the same for both crops. It must be understood, however, that linseed requires a shallower seed-bed than wheat or oats and for this reason cultivations for the final preparation of the seed-bed should be shallower than those for the cereals. By adopting these methods the necessary firm, fine, moist, weed-free seed-bed will be assured.

Varieties.

The linseed plant is susceptible to many plant diseases, including wilt and rust. In choosing a variety, therefore, it is essential that, where possible, a disease-resistant one be selected. Of course, the other factors of high grain yield, high oil content and suitability for the climate should not be neglected. There is a little local experience available on the matter of varieties. Trials have been conducted here for several years and the information obtained from these, together with some facts from New South Wales, are outlined in Table 1.

TABLE 1.

Variety.	Queensland Notes.	N.S.W. Notes.
Ameliore ..	Height 2 ft.; mid-season; seed capsules small but plentiful; mature heads bent over, probably due to weather effects. No rust recorded	Some rust susceptibility
Abyssinian ..	Height 1 ft. 6 in.; early to mid-season; capsules small and plentiful. Rust recorded in one plot only	Some rust susceptibility
Bolley Golden ..	Height 2 ft. 4 in.; mid-season; capsules medium, plentiful; yellow seed; heads upright. No rust recorded	Rust-susceptible and a poor yielder
Ghahreh ..	Height 2 ft. 6 in.; late season; capsules medium to small and fairly plentiful. Rust attacks recorded	Rust-susceptible
Malabrigo ..	Height 2 ft. 9 in.; late maturing; capsules variable in size but plentiful. No rust recorded	Rust-resistant
Morocco ..	Height 2 ft. 4 in.; mid-season; fairly large capsules. No rust recorded	Rust-susceptible
Rio	Height 3 ft.; late or mid-season; capsules medium and fairly well filled. No rust recorded	Rust-resistant
Walsh	Height 2 ft. 9 in.; medium-early; capsules large and plentiful. No rust recorded	Rust-resistant

During the 1947 season a number of farmers on the Darling Downs grew small areas of the variety Walsh. This variety did well on black soils in a number of districts, and yields varying from 6 to 8 bags of graded seed per acre were obtained. This seed had an oil content varying from 40·5 per cent. to 37·43 per cent., which can be regarded as satisfactory.

Rate and Time of Sowing.

The rate of sowing and the time of sowing both affect the yield of linseed. Table 2, taken from a bulletin issued by the Department of Agriculture of South Australia, illustrates this point.

TABLE 2.

YIELD OF LINSEED IN BUSHELS PER ACRE, 1940.

Seed Rate. Lb. per Acre.	Time of Sowing.			Means of all Sowings.
	8th May.	22nd May.	5th June.	
40	10·43	7·63	7·03	8·36
60	10·02	6·70	6·69	7·80
80	9·08	6·89	6·74	7·57
Mean of all seed rates	9·84	7·07	6·82	..

Considering these South Australian results and also the recommendations made in New South Wales, it is evident that for maximum seed production a light sowing rate is essential. From observations made in Queensland in 1947 it seems evident that a sowing rate of from 20 to 30 lb. per acre is satisfactory for this crop on the Darling Downs.

Sowing should be early because it is desirable to have the crop ripe and fit to harvest before the November storm rains occur. A wet period at harvest time makes the crop difficult to handle because of the increased toughness of the stem, the prolonged flowering and the induced secondary growth. Mid-April to mid-May, then, seems to be the most satisfactory sowing period for this State, provided sufficient rain falls during this period to establish the crop.

Methods of Sowing and Depth of Sowing.

The crop may be sown satisfactorily with the ordinary wheat drill or the combine, both of which are readily adjusted to sow at the desired rate. One or two trial runs before sowing should be sufficient to indicate the correct adjustment. All the seed tubes of the machine are used so that the crop will be sown in rows 7 inches apart.

The following gear setting was used to establish a trial plot in 1947 on the Darling Downs. Using a Sunshine combine, the slowest drive gear was engaged with the 16-tooth cog and the seed was put through the wheat side of the combine without the use of reducers. This arrangement gave a sowing of 30 lb. to the acre and an excellent stand was established.

Seed drills, whether new or old, can spill a lot of seed from holes and crevices in the machine, and the slippery linseed is prone to find such adventitious outlets. Care should be taken, therefore, to tighten up the seed-box sections and to block up any holes or crevices in the machine.

An even stand is essential for a good crop and, consequently, sowing at an even depth in a properly prepared seed-bed is a desirable practice. The best results have been obtained by drilling the seed in at a depth of 1 inch, and certainly it should be placed no deeper than 1½ inches. If sown any deeper than this germination will be uneven.

Harvesting.

The crop must be fully mature and dry before harvesting commences. With the crop in this condition there should be no difficulty in harvesting with the ordinary wheat header or auto header. Briefly, the best time to harvest the crop is when the stems have turned yellow and the majority of the bolls are brittle and ripe. Harvesting should not commence before the crop has had a good period of hot sunshine in the morning.

Linseed production can only be successful while the costs of production are kept low. Thus the greater the mechanization of the industry the better the chance of making it pay. The header, therefore, which can and does handle the crop efficiently, is the best and only implement to be considered for the harvest. Some adjustments are necessary, but these present no difficulty.

Experience in New South Wales shows that the oat riddle, set more nearly horizontal than usual and with the lips facing back, is the best to use. The fan speed or air inlet should be regulated to sort the material without blowing out the seed. A bar drum is preferable to a peg drum and the drum should be adjusted in both speed and clearance so that it just breaks the bolls completely without damaging the seed.

The harvesting machinery can spill a lot of seed through any outlet or crack in the woodwork, and so steps must be taken to seal all cracks and crevices through which seed might escape.

Diseases and Pests.*

The linseed plant is susceptible to flax rust, flax wilt and soil-borne seedling diseases. Initial treatment of the seed with organic mercury dusts may have a beneficial effect in controlling some of these diseases, but the use of disease-resistant varieties whenever they are available is the best method of combating wilt and rust. However, even when using the resistant varieties, it is advisable to refrain from growing linseed on the same area two years in succession.

Insect pests also attack the linseed crop. At present these are known to include cutworms, corn-ear worm, the Australian plague locust and the red-legged earth mite. The corn-ear worm, although present in crops during 1947 without doing a great deal of damage, may present the greatest hazard to the production of linseed on the Darling Downs. In New South Wales in the same year, the corn ear worm infestation was so serious that dusting with D.D.T. dust from the air was necessary. Although it did no serious damage to the Darling Downs crops in 1947, when it appears it is desirable to adopt the control measures outlined hereunder.

Dusting of linseed with D.D.T. will give good control at a cost of from 15s. to £3 per acre for materials, the cost depending on the rate of application of the dust and the number of times the crop is treated. Rate of application at each dusting would be from 20 to 30 lb. of a 2 per cent. D.D.T. dust per acre. Crops will require from 1 to 4 dustings, depending on the severity of attack, growth of the crop in late spring and length of time during which heavy flowering occurs. In areas where the weather continues dry throughout the spring and yields are expected to be low, a single dusting at the rate of 20 lb. of 2 per cent. D.D.T. dust is suggested. Where crop prospects are reasonably good and yields of 15 to 20 bushels per acre seem likely, two dustings would be worth while. The first dusting should be made within a week after flowering begins, the second being applied 7–10 days later. A third and even a fourth similarly-spaced treatment might be given if infestation continues severe after flowering.

The critical period for most areas is expected to be from late September to about mid-October. Infestation should be at its peak while flowering and setting of the young bolls are at a maximum.

Marketing.

The 1947 crop of linseed in Queensland was grown for seed purposes. Each grower was supplied with seed by Meggitt Ltd., of Sydney, and produced the crop under contract to this firm. All seed produced has been set aside for planting during the 1948 season.

Meggitt Ltd. again intend to supply seed to growers during 1948, but at a cost of £1 12s. 6d. per bushel (56 lb.) of graded seed and on condition that the grower signs a contract with the firm. A price of £40 per ton of 2,240 lb., or the current value of imported linseed of equal quality if it be greater than £40 per ton, will be paid to the grower. However, this price will be paid only for sound, fully-matured grain, and dockages will be made where impurities or admixtures are present in excess of 2½ per cent.

* Recommendations for control approved by the Science Branch of the Department.

The Channel Country of South-Western Queensland.

By ARTHUR F. BELL,* Under Secretary for Agriculture, and Deputy Chairman, Bureau of Investigation of Land and Water Resources.

THE so-called "channel" country of south-western Queensland is one of the least known, but one of the most interesting tracts of land in Australia. Indeed it is no exaggeration to say that this unique, and vast, natural irrigation system ranks among the world's most interesting natural features. The channel country is situated in the neighbourhood of the "three corners," where Queensland touches the Northern Territory, South Australia, and New South Wales; it was the scene of the tragic finale of the ill-fated Burke and Wills expedition in 1861.

Remote and difficult of access it has remained very largely an unknown land, with potentialities alternately painted in vivid and sombre colours by its infrequent visitors. Now, however, the Commonwealth Government has formulated plans to build a standard gauge strategic railway from New South Wales, through Western Queensland, to the Northern Territory. If implemented, these plans could obviously have a far-reaching influence on the future of the channel country. It was with these possibilities in mind that the Bureau of Investigation of Land and Water Resources recently carried out a comprehensive physical and economic survey of its resources.

The "Centre" in the Remote Past.

In the distant past the centre of Australia was very different from the arid picture it presents to-day. It was well-watered, and mighty streams flowed from high mountain ranges to discharge into the sea which extended northwards from the present Great Australian Bight. But, as the ages passed, the mountains were slowly worn down and the sea silted up, the rainfall declined, rivers ceased to flow, and the climate changed completely. To-day, only the ghosts of the once mighty rivers remain, and only occasionally do they flow into Lake Eyre, now a shallow, intensely salt lake, lying forty feet below sea level.

Of the streams which remain the most important are the Cooper, the Diamantina, and the Georgina. For most of their length these rivers flow through arid country, but their main tributaries rise in the comparatively well-watered zone south of the Gulf of Carpentaria. As a result of monsoonal rains in this upper part of their watersheds, they periodically flood.

The slow weathering of this ancient land has smoothed it out, and for a distance of some 500 miles above Lake Eyre the fall of the streams is only about one foot in a mile, or even less. With no permanent flow of water to maintain the stream bed, these periodic floodings have cut innumerable channels in the flat terrain. For a distance of about 200 miles upstream from the South Australian border there is no well defined single stream, but a complex network of criss-crossing shallow channels. Aerial photographs reveal these remarkable streams as resembling a gigantic and unevenly spread fishing net of variable sized mesh.

* In a National Country Hour broadcast from 4QR, Brisbane, 1 March, 1948, and published by courtesy of the Australian Broadcasting Commission.

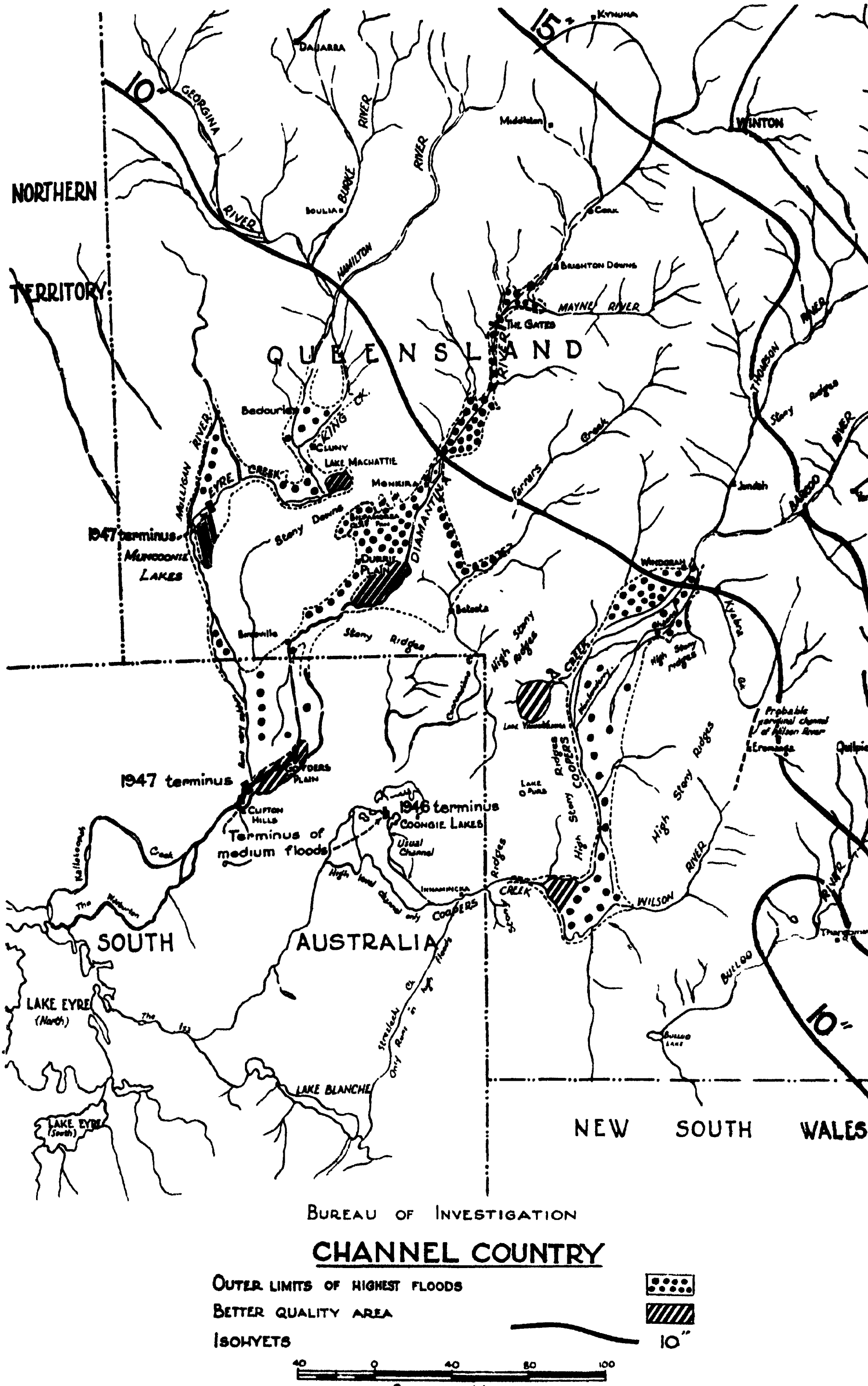

NORTHERN TERRITORY
QUEENSLAND
SOUTH AUSTRALIA
NEW SOUTH WALES
10
15
10"
GEORGINA RIVER
BURKE RIVER
HAMILTON
RIVER
Dajarra
Boulia
Middleton
Kynuna
WINTON
Cork
Brighton Downs
MAYNE RIVER
The Gates
THOMSON RIVER
BARCOO RIVER
Stony Ridges
Jundah
Windorah
Kyabra
Probable original channel of Wilson River
Eromanga
Quilpie
Bedourie
KING CK.
Cluny
Lake Machattie
Monkira
EYRE CREEK
MULLIGAN RIVER
1947 terminus
Muncoonie Lakes
Stony Downs
Durrie Plain
DIAMANTINA
Farrars Creek
Betoota
Birdsville
Stony Ridges
High Stony Ridges
COOPERS CREEK
Lake Yamma Yamma
1947 terminus
Goyders Plain
Clifton Hills
Terminus of medium floods
1946 terminus
Coongie Lakes
Lake Hope
Usual Channel
Innamincka
COOPERS CREEK
WILSON RIVER
Thargomindah
BULLOO
Bulloo Lake
The Warburton
Kallakoopah
Creek
LAKE EYRE (North)
LAKE EYRE (South)
LAKE BLANCHE
Strzelecki Ck.
Only flows in big floods
The Isa
Bureau of Investigation
CHANNEL COUNTRY
Outer limits of highest floods
Better quality area
Isohyets
10"
40 0 40 80 100
Scale of Miles

Plate 40.

This is the "channel country' and in each river it varies in width from about 5 to 30 or 40 miles.

Where Flood Waters Flow.

Floods coming down from the upper reaches of the Cooper, Diamantina, and Georgina enter the channel country near Windorah, Diamantina Gates, and Bedourie respectively. There the flood waters spread out into the vast networks of channels and the crest of the flood passes slowly southwards towards Lake Eyre at the rate of perhaps 4 or 5 miles a day.

The area inundated naturally depends on the height and volume of any particular flood. On the Cooper the maximum inundation by a major flood is about 3½ million acres. The flooded area is not, of course, a solid block, but is interspersed with somewhat higher sections which are not submerged in any flood.

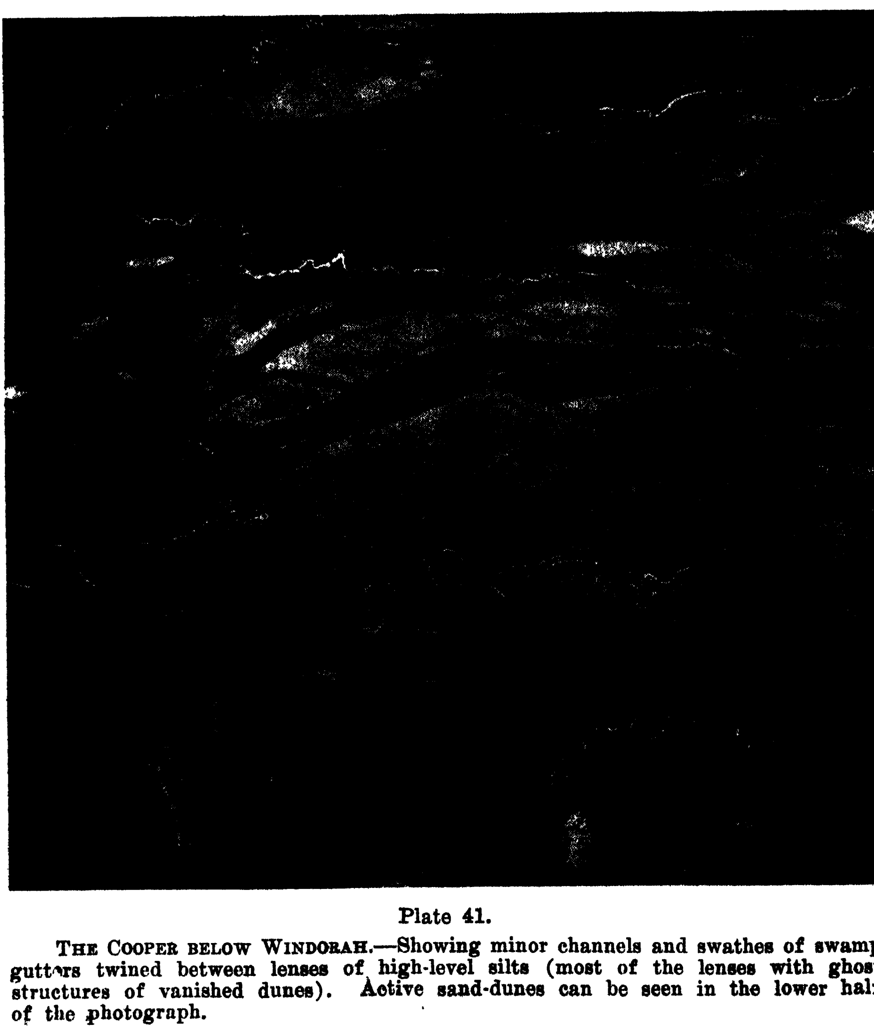


Plate 41.

THE COOPER BELOW WINDORAH.—Showing minor channels and swathes of swamp gutters twined between lenses of high-level silts (most of the lenses with ghost structures of vanished dunes). Active sand-dunes can be seen in the lower half of the photograph.

With the exception of the larger channels the period of inundation is but a matter of days, and as the flood passes southwards there springs up a vigorous growth of quick-maturing annual grasses, clover, and herbage; at this time the channel country is perhaps the best cattle-fattening country in the Commonwealth. The feed remains palatable and nutritious for several months after this single irrigation.

A Fattening Area.

The channel country serves primarily as a fattening area for store cattle which have travelled in from the breeding grounds of the Northern Territory and the Gulf. Once in the channels these cattle fatten to prime bullocks amazingly quickly, but unfortunately they have to be walked both into the fattening area, and out of it to market. The stock routes pass through unfavourable country and not only is condition lost on both inward and outward walks, but they must be held longer in the channels. Young baby beef cannot be marketed in its

Plate 42.

HUNTER'S GORGE ON THE DIAMANTINA AT DIAMANTINA GATES.—A bottleneck where the channel country is constricted between cliffed areas of laterite.

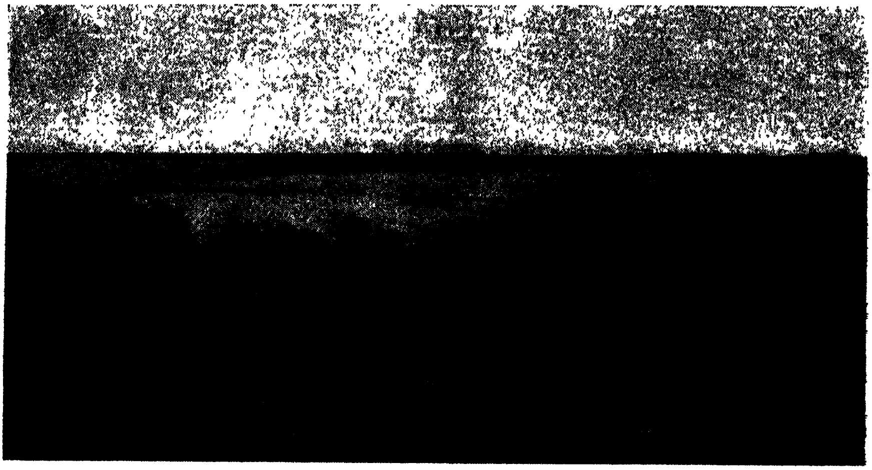


Plate 43.
COONGIE LAKE, SOUTH AUSTRALIA, TERMINUS OF COOPER FLOODS.

[*P. J. Skerman, photo.*

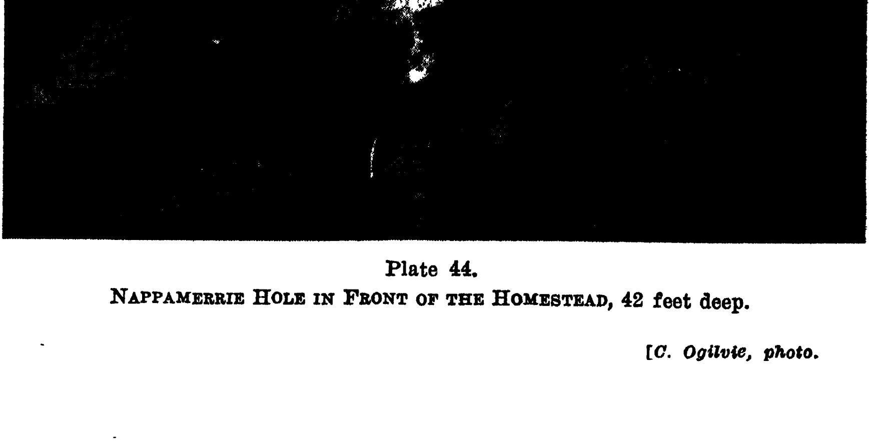


Plate 44.
NAPPAMERRIE HOLE IN FRONT OF THE HOMESTEAD, 42 feet deep.

[*C. Ogilvie, photo.*

Plate 45.
BREAKAWAY FROM EULBERTIE WATERHOLE WHICH FEEDS LAKE YAMMA YAMMA.

[C. Ogilvie, photo.

Plate 46.
CULYAMURRA WATERHOLE, NEAR THE SOUTH AUSTRALIAN BORDER.

[C. Ogilvie, photo.

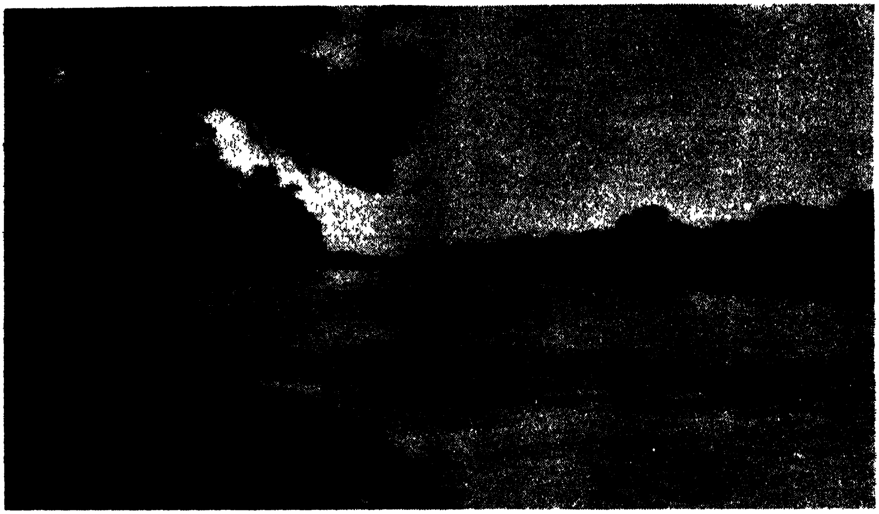


Plate 47.

LOOKING DOWN EULBERTIE WATERHOLE.—Probably the biggest in Western Queensland, now 16 miles long and 35 feet deep.

[C. Ogilvie, photo.

Plate 48.

CURRAREVA WATERHOLE, WINDORAH.

[C. Ogilvie, photo.

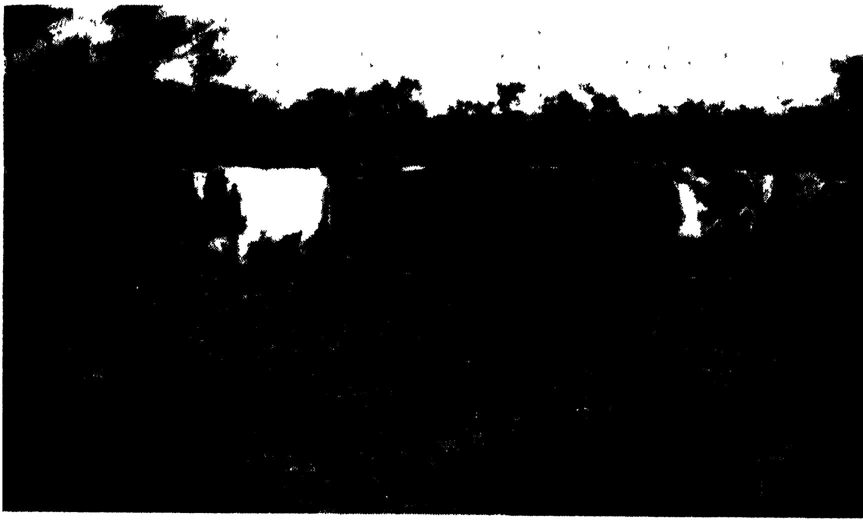


Plate 49.
MUSTERED FOR MARKET.—Fat cattle on the Cooper.

[*D. Macfarlane, photo.*

Plate 50.
MOB OF TANBAR BULLOCKS ON THE ROAD TO THE RAILHEAD.

[*D. Macfarlane, photo*

best condition, because cattle must be held until they can stand the long walk to the Queensland railheads or down into New South Wales or South Australia. About 40 per cent. of the fat cattle from this area are now marketed in Adelaide, and 30 per cent. in New South Wales.

It has often been suggested that these rivers be dammed so that the excess waters of big floods could be stored, and released in dry years to irrigate the channels. The investigations of the Bureau have shown, however, that this is not feasible: Firstly, big floods are not frequent and in most years the present natural system of irrigation channels uses the available water efficiently. Secondly, there are no suitable sites for the storage of large volumes of water; the flat nature of the land would mean broad shallow reservoirs from which, in that dry country, most of the water would evaporate before its use became profitable, and the quantity remaining would not justify the high construction and administrative costs. Moreover, the riparian rights of the cattle stations lower down the rivers, and the claims of South Australia to water, must have first consideration.

On the other hand, there is no doubt that a suitably placed railway would greatly increase the productive capacity and stability of the channel country. Store cattle could be railed in from the breeding grounds immediately the floods had passed, instead of being walked in; not only would they arrive in better condition but they could also arrive some five to ten weeks earlier. The fat cattle could later be railed out, saving both loss of condition on the road and permitting the marketing of younger bullocks. Furthermore, in years of no flood any stock held in the channels could be railed away to relief areas and losses greatly reduced.

Plate 51.

FAT BULLOCKS ON TANBAR, IN THE "CHANNEL" COUNTRY.

[*D. Macfarlane, photo.*

Fat Cattle from the Cooper.

Over the past 20 years the turn-off of fat cattle from the Cooper has averaged about 21,000 per year, but it has been estimated by the Bureau that with reasonable rail facilities this could be increased to an annual average of at least 80,000, with a maximum in a big flood year of about 200,000. If the productive capacity of the Diamantina and Georgina be taken as together equal to that of the Cooper, the total average turnoff could be in the vicinity of 160,000 a year, with a maximum of 400,000.

The addition of these numbers of prime fat cattle would be of great importance in the development of Australia's meat trade; furthermore, they would be marketed at a time of year when the numbers of fat cattle from other sources are declining. It is true that the productive capacity of the channel country does not of itself warrant the building of any great length of railway, but if (as seems inevitable) a strategic north-west railway is to be built, then, by suitable routeing, it can also be used to develop an important food production area which, incidentally, would also be strategically placed.

QUEENSLAND SHOW DATES, 1948.

Barcaldine	May 12–13
Beaudesert	May 6–8
Biggenden	May 20–21
Biloela Rodeo	May 21
Biloela Show	May 19–20
Boonah Campdraft	May 27 and 29
Boonah Show	June 4–5
Bowen	June 30–July 1
Brisbane R.N.A.	August 7–14
Bundaberg	June 3–5
Cairns	July 20–22
Charleville	Abandoned
Childers	May 31–June 1
Chinchilla	May 13–15
Cooroy	August 28
Crow's Nest	May 28–29
Dirranbandi	May 28–29
Eidsvold	May 3–4
Esk	May 14–15
Gatton	July 15–17
Gayndah	May 12–14
Gin Gin	June 7–8
Gladstone	June 10–12
Goomeri	May 17–19
Goondiwindi	May 1 and 3
Gympie	May 20–22
Ingham	July 16–17
Inglewood	May 7–8
Innisfail	July 30–31
Ipswich	May 11–13
Kalbar	May 29
Kilkivan	May 25–26
Kingaroy	May 6–8
Laidley	June 25–26
Lawnton	July 30–31
Lowood	June 11–12, 14
Mackay	June 22–24
Malanda	September 3–4
Marburg	May 7–8
Maryborough	May 27–29
Miles	May 19–20
Murgon	May 20–22
Nambour	July 1–3
Oakey	March 17–18
Proserpine	June 25–26
Rockhampton	June 16–19
Roma	May 5–6
Rosewood	July 9–10
St. George	May 14–15
Tara	May 7–8
Taroom	May 3–5
Thangool	May 14–15
Toogoolawah	June 18–19
Townsville	July 6–8
Warrill View	May 22
Wondai	May 13–15

Velvet Beans for Green Manuring.

By NORMAN J. KING.*

PRIOR to 1930 the principal green manure crops grown by cane farmers in the Bundaberg area were Mauritius bean, black cowpeas, and the clay-coloured giant cowpeas. The advent of Poona pea at about this period, with its reputation for vigorous growth and early maturity, was responsible for the almost complete disappearance of the Mauritius bean and black-seeded cowpea varieties. The clay-coloured giant cowpea has survived in the Isis area but is rarely seen growing on a large scale in the Bundaberg district.

The Mauritius bean (one of the velvet bean family) is characterised by excellent vigour, a long growing season, very heavy crop, and a dense mass of vine and leaf growth. It has a deeper and more extensive root system than the Poona pea and shows much less distress in dry periods. At the time when Poona pea came into favour the disadvantages claimed for the Mauritius bean were (*a*) difficulty in ploughing in the heavy vines and (*b*) the poorer early cover. At that time tractor ploughs and tandem disc harrows were not in common use as they are to-day, and a good Mauritius bean crop would probably be no obstacle to present day farm implements. The poor early cover of Mauritius bean was the result of the lighter seeding used with this large seeded species. Seed generally cost about £2 per bushel and was, in consequence, used sparingly. The most successful growers of this crop overcame this difficulty by planting in drills at the rate of 20 to 30 lb. per acre. This method economised on seed when compared with broadcast methods and allowed interspace scarifying on dirty land until runners met across the rows. With modern fast tractors and cultivators this job is done speedily and is amply repaid by the prevention of weed and grass seeding in the fallow.

In recent years growers in general are frankly critical of the Poona pea. Some go so far as to say that the characteristics of the crop have changed but all are agreed that its vigour and general performance are not what they used to be. Whether this is right or wrong is not the purpose of this article, but the impression is gained that a change in variety would be welcomed. Experience on the Bundaberg Station during the season of 1946-47 suggests that reversion to the growing of the velvet bean types may be the answer for the time being. The Director of Agriculture supplied to the Bureau small quantities of seed of six velvet bean varieties for field trial purposes. These varieties were Black Mauritius Q.1660, White Mauritius Q.1432, Marbilee Q.1744, Jubilack Q.1742, Smith Q.708, and Somerset Q.707. These were planted on the Bundaberg Station on 23rd September, 1946, in a block which had had a Poona pea crop the previous summer and had been bare fallowed since that time. The varieties were planted in drills 4 feet apart and each plot consisted of four rows 87 feet long. Four plots of each variety were planted. There was only fair soil moisture at planting time and germination did not take place until 99 points of rain fell on 27th October. At the same time volunteer Poona pea appeared on that portion of the block not planted with the trial, the seed being there from the previous crop. No further rain was recorded until mid-November when some three inches fell over a

* In the *Cane Growers' Quarterly Bulletin* (Bur. Sug. Expt. Stns., Dept. Agric. & Stk., Q.) for January, 1948.

period of a week. This gave a good burst of growth but December remained very dry and no useful rain fell again until an inch in mid-January. This two months without effective rain, in the middle of the hot weather, gave a severe check to the Poona pea. It ceased growing, wilted and began to flower as is its habit when checked. The velvet beans continued to make growth, threw out long vigorous runners and were not apparently distressed by the dry soil conditions. Growth continued normally with the good February and March rain and by late March flowers and young pods were noticed in all varieties, while the soil surface under the plants was covered with a thick litter of bean leaves.

Despite the lack of rain from mid-November to mid-January the beans had met across the interspaces and provided a good cover by early January. So vigorous was the growth that on three occasions the runners which were encroaching on the adjacent plots had to be cut and thrown back. In mid-April about 10 per cent. of each plot was cut off level with the ground and weighed so that the tonnage per acre of each plot could be obtained. The remainder was left for seed collection. The two bad germinators, Jubilack and Smith, were not weighed as their stand was so sparse, but seed was collected for further trial. The tonnages were as set out in Table I.

TABLE I.

GREEN HARVESTING WEIGHTS OF VELVET BEANS.

Variety.	Tons per acre.				Average.
	Plot 1.	Plot 2.	Plot 3.	Plot 4.	
White Mauritius	13·6	10·9	7·5	14·8	11·7
Black Mauritius	13·9	13·9	15·6	16·3	14·9
Somerset	13·4	13·6	13·6	15·6	14·1
Marbilee	15·8	16·5	17·3	17·5	16·8

Analyses of the dried material were made and the results are set out in Table II.

TABLE II.

ANALYSIS OF DRIED VELVET BEAN SAMPLES.

Laboratory Number.	A2690.	A2691.	A2692.	A2693.
Variety.	Black Mauritius Q1660.	Marbilee Q1774.	Somerset Q707.	White Mauritius Q1432.
	Per cent.	Per cent.	Per cent.	Per cent.
Total Organic Matter	87·71	88·01	88·98	88·34
Total Mineral Matter	8·12	8·34	7·97	7·84
Moisture	4·17	3·65	3·05	3·82
	100·00	100·00	100·00	100·00
Insoluble	0·40	0·36	0·42	0·44
Lime (CaO)	2·45	2·32	2·45	2·65
Magnesia (MgO)..	1·05	0·97	0·89	0·84
Potash (K_2O)	0·42	0·43	0·41	0·36
Phosphate (P_2O_5)	0·41	0·38	0·45	0·43
Total Nitrogen	3·00	3·10	3·18	2·96
Protein (N x 6·25)	18·75	19·38	19·88	18·50

The nitrogen content of these crops is particularly good and, in the case of a 15 tons per acre yield, represents a gain to the soil of approximately 200 lb. per acre of nitrogen which is equivalent to 1,000 lb. of sulphate of ammonia. Even more important features of the velvet bean type of crop are the resistance to bean fly and wilt. The former is always likely to destroy Poona pea crops in any part of the sugar belt if conditions are favourable, while the latter causes severe losses in the wetter parts of the North. The drought resistance of velvet beans makes them a desirable type for all areas where soil moisture is likely to be a limiting factor in crop growth and the deep root system must have an ameliorating effect on subsoil conditions. Where land can be left under long fallow and not planted with cane until August or September the velvet beans are of particular value. The ground is covered from February onwards with a dense crop and the fallen leaves produce an excellent decomposing leaf mulch on the soil surface. It is this rotting surface material which assists in the development of a desirable soil texture, without which good planting tilth is unobtainable.

All seed from the six varieties of velvet beans mentioned above has been collected and will be replanted in spring 1948 under a range of conditions and soil types. As soon as the best is selected arrangements will be made to propagate seed stocks commercially so that the variety will be available to cane growers.

The Introduction of Badila Cane into Queensland.

By C. G. HUGHES.*

ALTHOUGH this article happens to appear at a time when the percentage tonnage of Badila is decreasing it is certainly not an *in memoriam* notice, for there is still a future ahead of this fine variety and it will be many years before it is displaced from its position as the leading cane of the State. It is common knowledge that Badila came originally from a native garden in New Guinea, being brought back by the expedition led by the late Mr. Henry Tryon, but, as far as the present writer is aware, details of the trip have never been published. They have been brought to light recently during an attempt to reduce the enormous piles of correspondence which had accumulated in the Department of Agriculture and Stock building, William Street, Brisbane, during the past fifty years or more. Most details of the expedition are there, together with the distribution and behaviour of the varieties when grown at Mackay and Kamerunga (near Cairns). Many of the letters are in the beautifully uniform handwriting of the copying clerks but a proportion are typewritten in a type not seen on modern machines, and others again are in the honest, laboured hand of men apparently more used to working than to writing. The idiosyncrasies of personalities and the oddities of Government administration are displayed in candid fashion but time has so smoothed them out that they are now seen to play only a small part in the story of the expedition.

* In the *Cane Growers' Quarterly Bulletin* (Bur. Sug. Expt. Stns., Dept. Agric. & Stk., Q.) for October, 1947.

The original intention of Mr. Peter McLean, then Under Secretary of the Department of Agriculture, was to use the cutter "Lizzie Jardine," which, under the command of Captain J. Griffiths, was employed on departmental work on the Central Queensland coast. However, the Captain's report on the condition of the vessel was so unfavourable that the idea was abandoned. Indeed it is remarkable that the "Lizzie Jardine" could be used for anything seeing that "her topsides above the copper were very bad, the wood around the bolts was quite rotten and her main-boom decayed." Arrangements were then made for a boat to be chartered from Burns Philp and Company and the cutter "P.C.E.," of nineteen tons, was obtained for a period of two months at £20 per month. It was to be handed over ready for sea in all particulars excepting wood and water, provisions and crew. Captain Griffiths was to proceed to Thursday Island with two men and take command of the cutter.

The Brisbane contingent left on s.s. "Warrego" on 26th August, 1895. It included Mr. Henry Tryon, Entomologist to the Department, John Liverseed, and Mr. R. Wilson. Mr. Tryon had been selected to lead the expedition because it was known that beetle and moth borers were present in New Guinea and an entomologist was properly considered to be more likely to obtain insect-free canes than one not so trained. John Liverseed, who later became manager of the Hermitage State Farm, was then storeman at the Department. He was put in charge of a supply of "trade" to be used for bartering with the natives. Items on his list included tobacco, matches, pipes, gilt chains (at two shillings per dozen), assorted beads (32 pounds at one shilling per pound), and some calico and twill. The medicine chest was under Mr. Tryon's direct personal control, apparently for the reason that it contained the only alcoholic liquor allowed on board. John Liverseed was also expected to assist in the collection of canes and their packing. Although it was not expressly stated that he should do so, he also used to carry Mr. Tryon ashore from the ship's boat so that Mr. Tryon would not get his feet wet or cut on the sharp coral. Mr. R. Wilson went as a passenger, but there is little mention of his activities on the expedition. He died only eight years ago, after rising to the post of Acting Under Secretary in the Department of Agriculture and Stock.

There was some dissension in the party after arrival at Thursday Island and Captain Griffiths, who had confessed to ignorance of Torres Strait and New Guinea waters, accepted the recommendation of the Government Resident, the Hon. John Douglas, C.M.G., to resign, and returned by mail steamer to Mackay. Captain Bebrouth was given command of the cutter and she sailed from Thursday Island on 14th September, 1895.

A call was made at Port Moresby in order to meet Sir William McGregor and present a letter of introduction from Mr. McLean. However the Administrator was away at the time and the expedition left the capital on 30th September without having seen him. The next few days were spent in calling at villages along the coast to the east of Port Moresby, but no canes were collected since all were suffering from the effects of the current drought. On 9th October, Mr. Tryon called on a Mr. Guise, who lived near Hula, and in consultation with that gentleman decided to organise a special trip to the Kemp Welch River. Seven days were spent up this river and, although little cane was

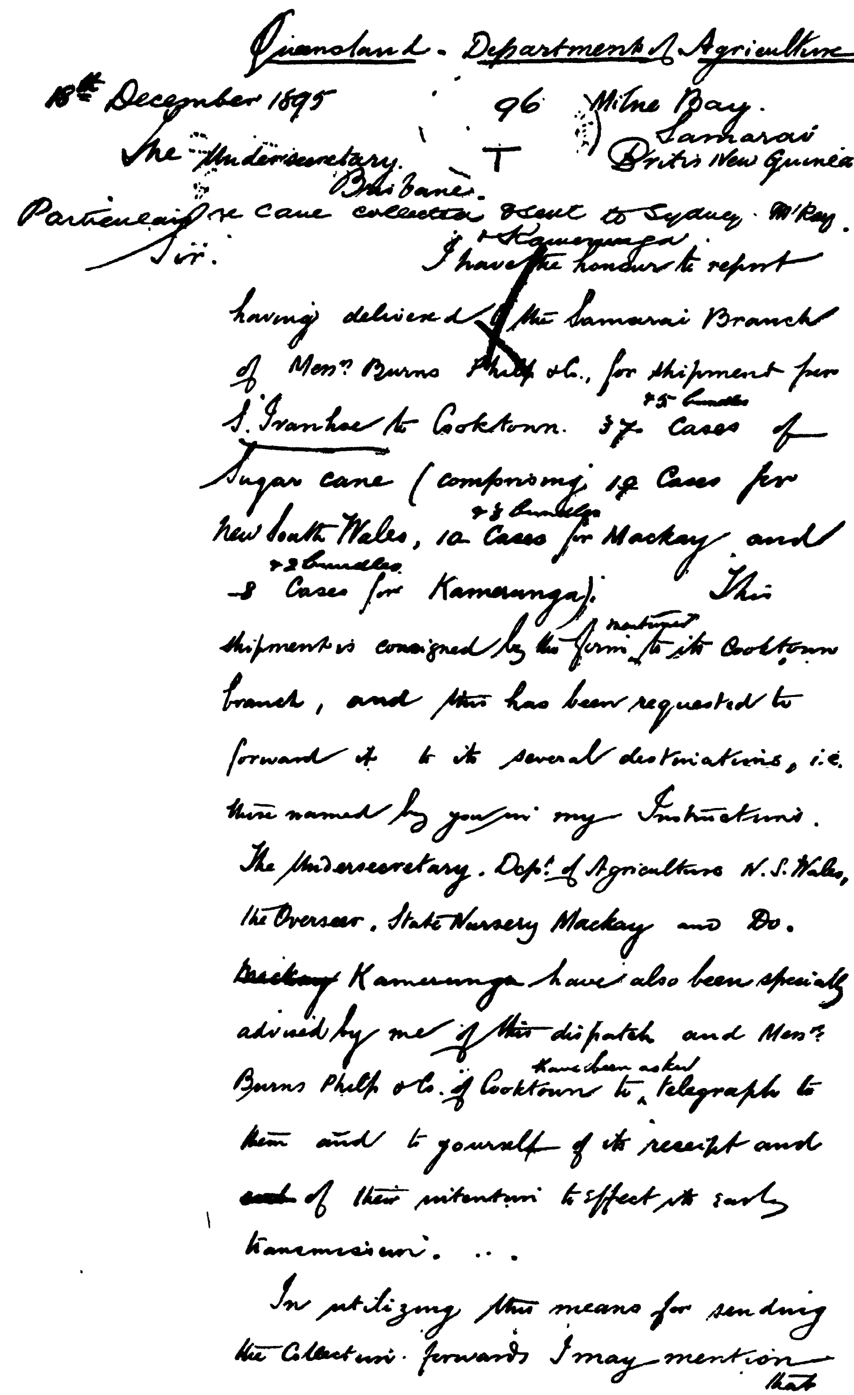
obtained, the trip was not without its excitements, as at one stage Mr. Tryon "was deterred from continuing his journey by reason of a threatened personal attack on the part of the inhabitants of a native village." A good deal of cane was seen but it was all either standover and riddled with boring insects or else far too young. The drought and near-famine conditions of the land were blamed for the lack of suitable canes and less than two cwt. were obtained. Varieties taken included some collected by E. Cowley in 1893, samples of which Mr. Tryon had brought with him in order to avoid undue duplication. This batch of cane never reached Queensland as it was later discarded owing to inability to ship it.

After leaving Kemp Welch River a severe storm was encountered and the Captain took shelter at Caution Bay, some thirty miles to the west of Port Moresby. Seas were still high when the voyage eastwards was resumed and the cutter put in at Port Moresby before going directly to Samarai on Dinner Island at the mouth of Milne Bay, where she arrived on 12th November. Mr. Tryon met Sir William McGregor at Samarai and after a long discussion Sir William proposed that Mr. Tryon should prolong his stay by about two months and, after discharging the "P.C.E.," attach himself to Sir William on the "Merrie England." This arrangement, however, was apparently not accepted. It was about this time that the Under Secretary began to get worried about the lack of canes and the mounting expenses, but several telegrams including one peremptory demand to return at once, did not reach "your obedient servant, Henry Tryon, Entomologist," until he had been back in Brisbane for some time.

It would appear that during the next month or so Mr. Tryon was too busy collecting canes to write any reports and the next letter from him, dated 14th December, 1895, at Milne Bay, mentions that the small amount of case timber still remaining would prevent much further sugar cane being obtained. Between 19th November and 12th December fifty apparently different varieties were secured from the country at the back of Bently Bay, and from between it and East Cape, and from that facing the entire seaboard of Milne Bay. "The obtainment has indeed been an arduous undertaking, involving on my part lengthy journeying on foot or in canoe, and my being on more than one occasion absent from the cutter for several days in succession." On 18th December, 1895, Mr. Tryon delivered to Messrs. Burns Philp and Company at Samarai 37 cases and five bundles of sugar cane collected in the Milne Bay area (see Fig. 38). A further collection was made in the Mullen's Harbour area and a number of bundles of cane brought from there.

Next news of the expedition was contained in a telegram from Cooktown announcing Mr. Tryon's arrival per "P.C.E." direct from Samarai. Apparently the Mullen's Harbour collection was aboard. The first consignment had come to Cooktown earlier on the schooner "Ellangowan" but had missed the weekly mail steamer and was still in store when the "P.C.E." arrived. With Mr. Tryon aboard and with both batches of cane the s.s. "Arawatta" sailed from Cooktown on 10th January leaving Mr. Wilson, John Liverseed, and a man named Hansen to pack surplus stores after paying off the cutter.

Meanwhile preparations had been made in Cairns to receive the batch for Kamerunga. A special train brought the two and a quarter tons from "Arawatta" to Redlynch Railway Station on the evening of Saturday, 11th January. On the following morning some of the cases



Queensland - Department of Agriculture

18th December 1895 96 Milne Bay.
Samarai
The Undersecretary. T British New Guinea
Brisbane.
Particulars re cane collection & sent to Sydney. McKay. & Kamerunga.
Sir. I have the honour to report
having delivered to the Samarai Branch
of Messrs Burns Philp & Co., for shipment per
S. Ivanhoe to Cooktown. 37 + 5 bundles cases of
Sugar cane (comprising 19 Cases for
New South Wales, 10 + 3 bundles Cases for Mackay and
8 + 2 bundles Cases for Kamerunga). This
shipment is consigned by the firm to its Cooktown
branch, and they has been requested to
forward it to its several destinations, i.e.
those named by you in my Instructions.
The Undersecretary. Dept of Agriculture N.S.Wales,
The Overseer. State Nursery Mackay and Do.
~~Mackay~~ Kamerunga have also been specially
advised by me of this dispatch and Messrs
Burns Philp & Co. of Cooktown have been asked to telegraph to
them and to yourself of its receipt and
~~and~~ of their intention to effect its early
transmission. . . .
In utilizing this means for sending
the Collection forwards I may mention that

Plate 52.

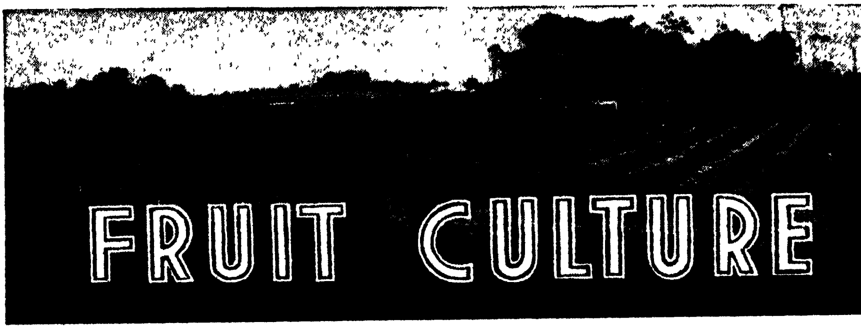
A facsimile of the first page of Mr. H. Tryon's covering letter referring to the consignment of cane plants from New Guinea, which included Badila.

and bundles were hauled to the Nursery. The first cane taken out of the first case opened showed that live borers were present. The cane was repacked and taken back to Redlynch station while Mr. Cowley awaited instructions. These were to the effect that he was to go ahead and plant the cane, which he did, cutting the sticks into small setts and carefully examining each piece. It was noted that the cane was shooting in the packing and shoots were often two to three inches long. Mr. Cowley records that the borer was seen in every variety except one, with infestation varying from "borer present" to "alive with borer." Fifty-six different varieties totalling some 2,000 setts were unpacked with No. 15, later to become widely grown as "Badila," represented by 96 setts. It had borer present and was a dark-purple, short-jointed cane. The crop from this planting was prolific, the average number of sticks was 10 and the leaves were broad and handsome; it was classified as "class 2, well in front."

The consignment for Mackay included the only complete set of the Milne Bay batch, as well as canes from Mullen's Harbour. A total of about two tons of cane was received at Mackay. Mr. D. Buchanan, the Overseer of the Nursery, reported that there was no need to be afraid of the borer in that locality (it was already there) as there was very little left of the first lot of canes after he had been through them. The lot from Mullen's Harbour was in better condition. There were fifty varieties in the first consignment, *i.e.* from Milne Bay, and thirty in the second, including a number of duplicates, from which a total of sixty-six different canes was obtained. A report in the following year stated that one No. 15 was "not a promising cane," although the other No. 15, from Milne Bay, was "a great crop"; the difference was more an indication of soil variation as between the two plots than any difference between the two canes.

The three and a half tons of cane sent to New South Wales did not open in good condition and only 13 cwt. of germinable plants were obtained. However, the N.S.W. Government paid £71 19s. 4d. as its share of the expenses of the expedition and everybody appeared to be reasonably well satisfied.

A little over seven tons of cane had been collected by the expedition, comprising 66 named canes plus six canes regarded as variants of the named. But the expedition had been away longer than expected and had cost more than the original estimate and in his report its leader thought fit to set out in detail the reasons why he was not more successful in obtaining sugar-cane plants. He declared that he had been sent at the wrong time of the year, that all the country from the islands of Torres Strait to Mullen's Harbour had suffered a long drought and that the capacity of the cutter was also a limiting factor. It is paradoxical that one of the very few, successful, Australian plant-seeking expeditions should have had to account for not being more successful.



Prevention of Frost Damage in Lady Finger Bananas.

L. G. TRIM, Assistant Adviser in Horticulture.

BANANAS are somewhat susceptible to cold injury in southern Queensland, and varieties of the Cavendish type, that is, the Cavendish and its various sports such as Mons Marie and Williams's Hybrid, are usually grown on hillsides above normal frost level. In addition, of course, plantations of these varieties are best located on northerly slopes, ranging in aspect from north-easterly to north-westerly, to ensure shelter from cold winds. The Lady Finger variety, on the other hand, does not as a rule thrive on the hillside sites chosen for the Cavendish and related varieties. Thus we find it grown for the most part on alluvial flats. Many of these situations are subject to frost and frost damage to plantations of this variety is therefore not uncommon. In fact, on some occasions it is so severe that all bunches and mature plants are lost and normal sucker growth does not start again until well into the following summer.

The winter of 1946 was one of the coldest on record in South Coast banana districts. Lady Finger plantings on creek banks in the Currumbin district and elsewhere suffered so severely that it might have seemed useless persevering with them. However, with the return of favourable growing conditions in the spring, new sucker growth responded remarkably and by the winter of 1947 many of these plantations were bunching.

One owner who had suffered considerable loss in 1946 resolved to make an attempt at frost prevention in 1947 in an area of about three acres of Lady Fingers, using a modification of the oil-burning method employed in citrus orchards. This plantation, with the Currumbin Creek forming its south-eastern boundary, was looking exceptionally well at the beginning of winter. The plantation consisted of 18 rows, each of 50 stools, planted 12 feet by 12 feet.

The Method Employed.

Firstly, all bunches round the edges were covered with brown-paper bags. Then seven oblong heaps of sawdust were built, each containing four sacks. Four heaps were equally spaced outside the first row on the north-western boundary of the plantation and the remaining three between the ninth and tenth rows. Once lit, these heaps smouldered continuously and, as they burnt away, they were replenished with more sawdust. This it was found necessary to do every third day.

Plate 53.

Plantation where frost prevention measures were undertaken in 1947, photographed on 18th September, 1947. This area was badly frosted in 1946.

Plate 54.

A second plantation nearby where no frost prevention was attempted, photographed on 18th September, 1947. Also badly frosted in 1946.

Finally, twenty-four 2-lb. fruit tins or tins of a similar size were secured and distributed equally in the third, ninth and fifteenth rows. They were filled, in the first instance, with coal tar, but later distillate fuel oil was added in varying proportions until finally a mixture of equal parts of each substance was decided upon as giving the best burning mixture. The 2-lb. tins then burned for about two hours. The coal tar alone was found to go out while the tin was still about half full, owing to the formation of a heavy soot deposit round the top.

Anti-frost operations were carried out from early in June, when the sawdust piles were lighted, until the middle of August, when the risk of frost seemed remote. Each morning an alarm was set for 4 a.m. and at this time the grower made his forecast. If he considered that a frost was likely the tins of fuel were set alight with a torch. This was done on twelve occasions.

For the whole operation there were consumed 15 yards of sawdust, 29 gallons of coal tar and 4 gallons of distillate oil, in addition to the brown-paper bags. The cost, therefore, was small.

Results.

To all intents and purposes, the steps taken to prevent frost injury were very successful. Only on the south-western edge was there any sign of chilling and it was thought that even this may have been prevented had the burning operations been extended beyond the outside row in this section.

The accompanying plates illustrate the position on 18th September, 1947, on this plantation (Plate 53) and on another one nearby where no attempt was made at frost prevention (Plate 54). Both these areas were badly frosted in 1946 and it seems reasonable to assume that, had the frost prevention measures not been undertaken, both would have suffered to approximately the same extent in 1947. One point of difference between the two years should be noted. In 1946 prolonged cold spells were experienced; in 1947 the cold spells were of short duration though on a number of occasions the minimum temperatures recorded were as low as those in the former years.

Conclusions.

It would be unwise to assume that frost damage to bananas could be prevented in all localities and in all seasons by the method described. Nevertheless, the evidence does suggest that, in view of the low cost involved, the method is worth a trial, at least in particularly valuable areas.

In deciding how to set out the sawdust piles and the fuel tins, due regard would need to be given to the local conditions on each plantation. Much would also depend on the grower's ability to forecast frost on his own farm, unless he was prepared to face the cost of lighting the fuel tins every night.

The effect of brown paper or other covers in reducing cold damage to the actual bunches is, of course, well established.

Acknowledgment.

It is desired to express appreciation to Messrs. G. Wendt and Sons, of Currumbin Creek, for the thoroughness with which they carried out this work and for providing details of the method used.

VEGETABLE PRODUCTION

Summer Lettuce Varieties in the Toowoomba District.

A. M. RICHARDSON, Adviser in Horticulture.

ALTHOUGH production of summer lettuce has been found to be somewhat difficult in all parts of Queensland, the Toowoomba district possesses certain climatic and other advantages over most other parts of the State. The soil in the vicinity of the city is well suited to the raising of small crops. As the natural rainfall is inadequate, the growth of such a crop as lettuce, which especially in the summer must not be allowed to suffer any check, can be undertaken only on farms where adequate irrigation is possible. Although this is in some cases a limiting factor, the water supply is on the whole ample and reliable.

Another advantage is that, while the local demand is appreciable, Toowoomba is also conveniently situated for the consignment of summer lettuce either to Brisbane, where the demand is very great, or to the western towns, so often under-supplied with much needed summer greens.

Varieties.

A trial of lettuce varieties has recently been conducted by the Department of Agriculture and Stock at Middle Ridge. This has given some very definite results which should be of value to local growers as well as to the home gardener. Five varieties were tried and the results clearly demonstrate the superiority of some of the recently developed types as compared with some of the older stand-bys.

The seeds were planted on 6th December. Cutting commenced on 30th January and was completed on 9th February. Blood and bone fertilizer was applied prior to planting at the rate of 350 lb. per acre. Weather conditions during the trial were somewhat severe in that abnormally high temperatures alternated with abnormally low temperatures.

The results of the trial are summarised in the following table:—

Variety.	Percentage of Heads Harvested.	Average Weight of Heads (lb.).
Great Lakes	100	1.01
Imperial 847	100	0.93
Imperial 44	94	0.92
Iceberg	89	0.84
American Summer	81	0.78

From this table it will be seen that not only did all the Great Lakes and Imperial 847 plants produce marketable heads but that the weight of the trimmed heads was in the vicinity of 1 lb. The performance of Imperial 44 was only slightly inferior. However, the other two varieties showed up comparatively poorly.

The Great Lakes plants made uniformly vigorous growth throughout and produced large, dark-green heads, rather flat when mature and of slightly coarse texture. These heads seemed very suitable for transport. The plants showed no tendency to bolt, that is, to run to seed prematurely. One or two diseases made their appearance but were confined to the outer leaves and did not detract in any way from the value of the heads.

The Imperial 847 variety also made uniformly good growth and produced well folded, reasonably solid heads. The plants showed no tendency to bolt and no blemishes appeared.

The performance of Imperial 44 was very similar to that of the other Imperial variety and a very attractive head was produced.

On the other hand, the Iceberg formed an elongated somewhat loose head which was obviously not suitable for transport. The plants also showed a marked tendency to bolt and the leaves were subject to tip burn.

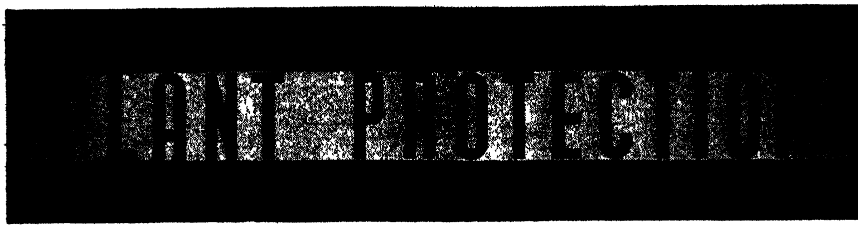
The American Summer lettuce, sometimes also known as Hanson, made very weak growth throughout the trial. The plants failed to form a heart and bolted to seed very early. For this reason they were harvested in an immature condition, but even then a pronounced bitter flavour was in evidence.

Conclusions.

While there appeared to be little difference between the varieties Great Lakes, Imperial 847 and Imperial 44, the impression was formed that at least for this season the first-named variety was slightly superior to the other two. In the same way, it was thought that Imperial 44 was also rather better than Imperial 847, largely because of the very compact head produced. The Iceberg was definitely unsatisfactory, while the American Summer variety proved worthless.

Acknowledgment.

Appreciation is expressed of the co-operation of Mr. B. West, on whose property this trial was conducted.



Water Blister Disease of Pineapples.

T. McKNIGHT, Pathologist.

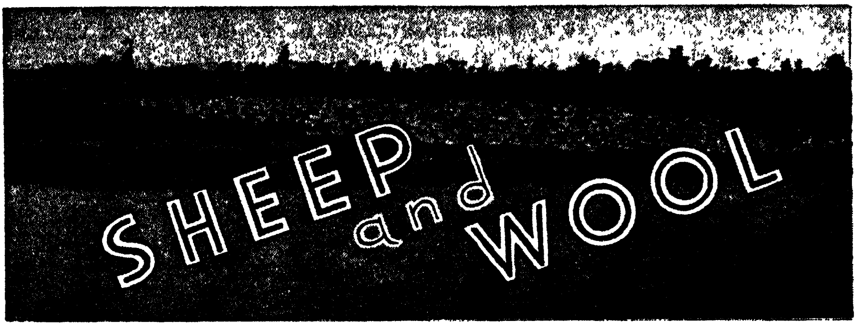
INSPECTIONS of a number of representative farms have led to the obvious conclusion that many growers do not yet grasp the fact that infection of fruit with the water blister fungus occurs on their own plantations mainly from spores originating from nearby dumps of infective material and from the floor of the packing shed. Where growers have had considerable water blister losses, inspection of their packing sheds has shown that neglect or carelessness in the disposal of discarded tops, leaves, fruits, knobs and other trimmings has been responsible for the infection of the fruit.

In the summer, particularly over the months of February and March, the water blister fungus enters and rots this discarded material and at the same time forms countless numbers of spores on the surface. These spores are carried in the air and germinate, like seeds of higher plants, after gaining entrance to the fruit through abrasions and bruises on the sides and shoulders of the fruit or through the stem end, and occasionally through the broken top.

During the last summer crop it was again very clearly demonstrated by Departmental experiments that careful attention to hygiene in the packing shed was sufficient to prevent losses from this disease. There is now no excuse whatever for growers to market fruit infected with the water blister fungus. If fruit receive careful handling during picking and packing operations, it is only necessary to see that no infective material is left lying in or around the packing shed to ensure that wastage from water blister is reduced to very small proportions, if not entirely eliminated.

Growers are therefore urged to dispose of dumps of discarded pineapple material by burying or burning and to spray their contaminated sheds thoroughly with a 5 per cent. solution of formalin. It may be noted that packing sheds with dirt floors are not as easy to keep clean and are more difficult and costly to sterilize than those with wooden or concrete floors. From then on growers must adopt a routine for the disposal of discarded tops and other material and maintain a high standard of hygiene in and around the packing shed.

This strict, but simple, maintenance of hygiene associated with careful handling of fruit and the rejection of cracked, sun-burned, "weeping" and "knobby" fruit are the measures adopted by careful growers who rarely receive a report of water blister disease in their southern consignments.



The Itch Mite of Sheep.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

THE itch mite of sheep* was first recorded in 1940 by Mr. H. B. Carter, of the C.S.I.R.'s McMaster Laboratory, when he detected the presence of this very small parasite in the skin of sheep depastured in New South Wales. It is known to occur in Queensland, but it is doubtful if it is of the same economic importance in this State as in New South Wales.

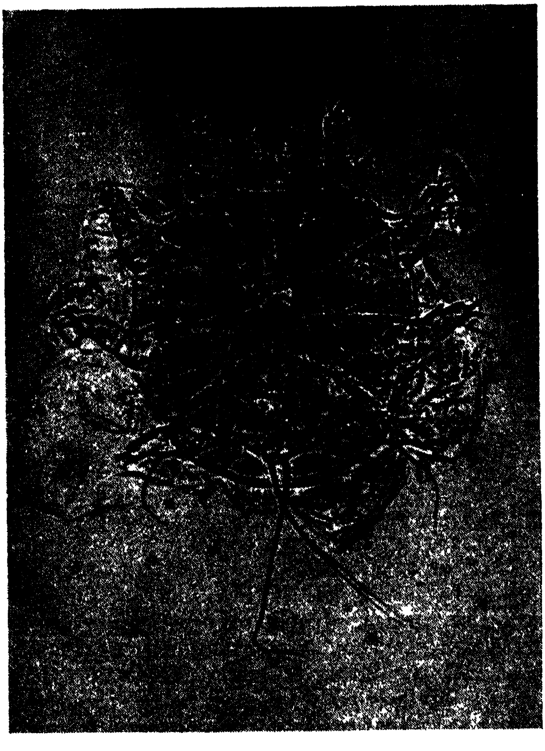


Plate 55.

A MUCH ENLARGED VIEW OF THE ITCH MITE.

* *Psororgates ovis.*

The mite is particularly small and can be detected only by microscopic examination. It appears to burrow fairly deeply into the skin of sheep and sets up a good deal of irritation, which is reflected in a torn and ragged fleece. The life cycle of the mite is not known, but it appears to remain a permanent parasite in that all of its life is spent on its host. The mite, which is shown in Plate 55, belongs to a group of parasites previously recorded as being common on rodents.

Sheep of any age may be affected, but, because of the slowness with which the mites spread, the incidence of infestation is higher in older animals than in the younger age groups.

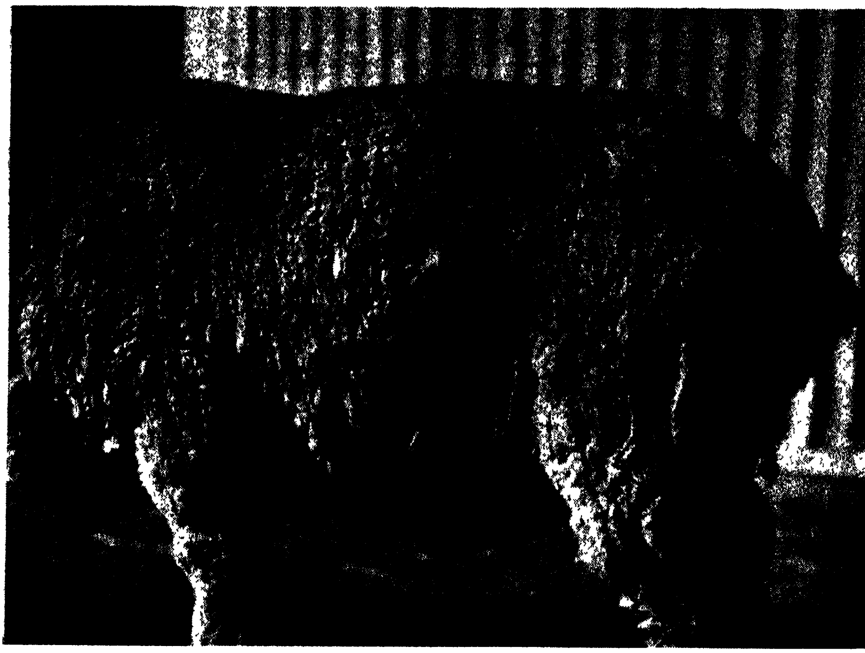


Plate 56.
THE APPEARANCE OF A SHEEP INFESTED BY THE ITCH MITE.

Symptoms Produced.

The symptoms produced by mite infestation vary, depending upon the number of mites and the time they have been on the sheep. Generally speaking, however, the signs shown are typical of those which might be exhibited by any animal suffering from a mild skin irritation. In the early stages sheep in the yards may be seen biting quite vigorously at their sides or thighs. Sometimes they rub against fences or posts. As the result of this the fleece presents a bedraggled, ragged appearance. Loose tassels of tangled wool may hang from the sides or thighs and externally the animals present an appearance typical of lice infestation (see Plate 56). Heavily infested animals may tear away large patches of their fleece as the result of violent rubbing. In horned sheep the front part of the horn may become smooth and polished from rubbing the fleece.

Plate 57.

THE UPPER PICTURE SHOWS NORMAL WOOL, THE LOWER WOOL FROM A SHEEP INFESTED BY THE ITCH MITE.

On closer examination it is found that the staple is inclined to be stringy, has a pointed tip, and contains dry scattered crumbs of scurf (Plate 57). The wool loses its tensile strength and can be broken any where along the staple. The fibres give the impression of having lost their elasticity, as their ends remain straightened out after a small staple has been broken.

In long standing cases the affected animal may be difficult to shear, as the fleece becomes badly cotted, and when it is removed the wool is difficult to tear apart.

The skin itself may not appear greatly altered, though there is an accumulation of scurf on the surface. If the wool is clipped closely a leaden hue is noticeable, and this seems to alternate with paler patches. The skin appears to be tougher than usual. The small "pin row" wrinkles on the skin become thin and hard and feel like a whip cord. In some cases a brownish moist scurf accumulates in greater quantities on the crest of the pin rows, and may even form a definite crust. Generally, however, it is loose, dry, and crumbly.

Course of the Disease.

The spread of mites from sheep to sheep and over an affected animal is very slow. It may take up to three or four years for the mites to spread over the greater part of the animal. Most commonly the wool of the sides, flanks, and thighs shows the effects of infestation first, and it is from these original points that the mites spread slowly in all directions.

Apparently the mites spread most readily from infested sheep which have been freshly shorn to non-infested sheep irrespective of whether these animals have been recently shorn or are woolly. Migration of mites from infested sheep carrying a fair length of wool appears to be uncommon.

Diagnosis.

Itch mite infestation is diagnosed by careful microscopic examination of skin scrapings from sheep which are showing symptoms similar to those described, but which are not suffering from lice infestation.

Control.

Itch mites are easily controlled by dipping affected flocks in lime-sulphur. A solution containing about 1 part of polysulphide sulphur on a weight/volume basis is used. Most lime sulphur concentrates on the market contain not less than 20 per cent. or 25 per cent. active polysulphide sulphur, and accordingly these can be diluted at the rate of 5 or 4 gallons to 100 gallons of water. Six ounces of Agral 3 per 100 gallons can be added to the dip (after the lime-sulphur and water are mixed) as a wetting agent. Even when Agral 3 is added, special care must be taken to see that the sheep are thoroughly wetted; accordingly it is as well to examine the sheep in the draining pen to see that the desired results have been obtained.

On emerging from the dip the sheep are a bright golden yellow colour, but as drying proceeds they become greyish and finally resume their natural colour.

Lime-sulphur solution is very poisonous to sheep, and should they swallow any of the dipping fluid death occurs fairly rapidly. Therefore particular care must be exercised when sheep are dipped.

"Cheesy Gland" or Caseous Lymphadenitis of Sheep.

G. R. MOULE, Officer-in-Charge Sheep and Wool Branch.

CHEESY gland is a disease of sheep which is widespread in Queensland and, although not many affected sheep die, it is of considerable economic importance. It is more than likely that most woolgrowers do not know that the disease occurs amongst their sheep until they accidentally discover that a leg of mutton which has been served for dinner contains an unpleasant abscess, full of yellowish pus, deeply concealed in the muscles. Quite naturally any carcasses affected with the disease are regarded as being unsuitable for export and it is because of this that the disease is of such economic importance.

Cheesy gland is essentially a chronic disease, that is, its course is characteristically slow. Usually it is marked by the formation of "cold" abscesses in the lymph glands which occur in various parts of the body, though it may become generalized and occur in the liver, lungs, spleen and/or kidneys.

It is caused by a specific organism which is particularly prevalent in the soil of sheep yards and recognized "sheep camps." The organism gains entrance to the body through wounds in the skin, but usually does not cause any local lesion. However, it does form one in the nearest lymph gland and produces a typical pus-filled abscess.

As it is a wound infection, cheesy gland is more common in older sheep, that is, ones which have been shorn a number of times and have had a large number of skin wounds inflicted upon them.

Symptoms.

The earliest symptoms include swelling of the affected glands, which may be extremely painful. Later, however, the gland becomes markedly enlarged and hard and presents the typical appearance of a "cold" abscess; that is, there is neither heat nor pain associated with its formation.

The glands most commonly affected are those deep down in the muscles of the hind leg; in the groin, in the flank and on the point of the shoulder. If the glands of the flank or the point of the shoulder develop particularly large abscesses they can be easily felt, and sometimes they burst externally and the wool becomes matted with a creamy-yellowish pus. Should this occur, healing is rapid after the pus is discharged.

If the disease becomes generalized, abscesses may form in the lungs and this can lead to the development of a dry cough, but quite often there are no very apparent symptoms associated with the formation of abscesses in the organs of the body. The causative organism of cheesy gland may spread from abscesses in the kidneys to the bladder, where it has been known to set up inflammation. When this occurs, the affected animal walks with a peculiar straddled gait of the hind legs and has a humped back. It may also urinate frequently.

Post-mortem Findings.

The usual findings on post-mortem examination include enlargement of the lymph glands; if the disease is advanced these contain a yellowish pus, which varies in consistency between that of thick cream and cheese. Sometimes the tissue of the gland is no longer apparent and there is just an encapsuled collection of caseous pus where the gland should be. Such lesions may be as large as a hen's egg.

If the disease has become generalized, single or multiple abscesses may be found in the lungs, kidneys, spleen and/or liver. These contain a characteristic thick creamy-yellowish pus.

Control Measures.

As cheesy gland is essentially a disease associated with wounding of the skin, control measures centre around the adoption of reasonable precautionary measures at lamb marking and shearing.

In the former operation the main points are to keep the instruments clean and to use temporary yards wherever possible. The lambs should be dropped on their feet after marking and the work arranged so that they go straight out into the pasture paddocks and are not held in the yards.

Precautions which might be taken at shearing time include the provision of grating over the counting-out pens and the shearing of young sheep first. In some cases it might be worth while palpating the glands near the surface of the body—that is, those on the point of the shoulder or in the flank—and drafting off any sheep which have enlarged glands. These can be shorn last and in this way the danger of spreading the disease through the gland bursting during shearing and fouling the combs and cutters is obviated.

TRIBUTE TO GRASS.

Grass is the forgiveness of nature—her constant benediction. Fields trampled with battle, saturated with blood, torn with the ruts of cannon, grow green again with grass, and carnage is forgotten. Streets abandoned by traffic become grass-grown like rural lanes, and are obliterated. Forests decay, harvests perish, flowers vanish, but grass is immortal. Beleaguered by the sullen hosts of winter it withdraws into the impregnable fortress of its subterranean vitality, and emerges upon the first solicitation of spring. Sown by the winds, by wandering birds, propagated by the subtle horticulture of the elements which are its ministers and servants, it softens the rude outline of the world.

Its tenacious fibres hold the earth in its place, and prevent its soluble components from washing into the sea. It invades the solitude of deserts, climbs the inaccessible slopes and forbidding pinnacles of mountains, modifies climates, and determines the history, character, and destiny of nations.

Unobtrusive and patient, it has immortal vigour and aggression. Banished from the thoroughfare and field it bides its time to return, and when vigilance is relaxed, or the dynasty has perished, it silently resumes the throne from which it has been expelled, but which it never abdicates. It bears no blazonry of bloom to charm the senses with fragrance or splendour, but its homely hue is more enchanting than the lily or the rose. It yields no fruit in earth or air, and yet should its harvest fail for a single year, famine would depopulate the world.

—*John J. Engalls, U.S. Senator of Kansas*, 1885.

Pink Eye or Blight of Sheep.

G. R. MOULE, Officer-in-Charge Sheep and Wool Branch.

MOST woolgrowers are familiar with pink eye or blight, which commonly affects sheep in Queensland. It is a highly contagious disease; that is, it can be spread readily from sheep to sheep. It is caused by a specific micro-organism.

Pink eye is more common during the summer months, particularly if the seasonal conditions are good, though it can occur at any time of the year. Sheep of any age or sex may be affected and the economic importance of this condition lies in the fact that animals suffering from this complaint are—

(1) Difficult to drove and/or muster.
(2) Retarded temporarily in growth and fattening.
(3) Likely to get cut off from the flock; in this way lambs may be lost or grown sheep may die from misadventure.
(4) Likely to lose the sight from one or both eyes; this can be very important in stud stock.

Transmission of Pink Eye.

One of the most characteristic things about pink eye is the rapidity with which it will spread through a flock. This brings up the interesting question of the way in which the disease is transmitted. It has been clearly demonstrated that the discharge from an affected eye contains the organism which causes the disease and a very small quantity of this discharge is capable, on being instilled into an unaffected eye, of setting up the complaint.

Under field conditions it appears that there are two ways in which the discharge from an affected eye might be transferred to the eyes of a healthy animal. The discharge may be wiped off on to long grass as the affected animal grazes and walks through the pasture and subsequently contact the eyelids and face (in close proximity to the eyes) of healthy sheep as they graze over the same area; or minute quantities of the discharge may be transmitted directly by insects such as "bush flies."

Symptoms.

Pink eye may run one of two courses, mild or acute. The first symptoms to be seen in either case include reddening of the inside of the eyelids and "watering" of the eyes. This discharge mats the hair on the side of the face as a copious flow of tears develops. If the animal is suffering from a mild attack it will usually recover at this stage. If, however, the attack progresses to become acute, the transparent part in the front of the eye (the cornea) shows some opacity, usually referred to as "milkiness," in about two days and the blood vessels of the eyeball become enlarged and inflammed.

As the opacity of the cornea develops the sheep become partly or wholly blind and affected animals experience difficulty in finding their way about their paddocks, in grazing and in watering. In the most acute stage of pink eye the eye is aptly described by stockmen as "a poached egg surrounded by a ball of fire." The whole of the eye becomes white, except for its yellowish centre. The eyelids are actually inflammed and reddened. There is copious discharge from the eye and the animal obviously suffers great pain.

Following the very acute stage the cornea may ulcerate and the eyeball may finally burst, extruding part of its contents. Should this happen the animals may never recover normal sight. If the eyeball does not burst, recovery is uneventful, except that a white scum which regresses slowly may develop on the cornea.

The disease usually takes 10-14 days to run its course on any one sheep but it smoulders slowly through a flock and an outbreak may last from six to eight weeks.

Recovered animals are usually immune for only a few months and accordingly are susceptible to re-infection next "season." Unfortunately some animals remain "carriers" of the causative organisms and in this way act as reservoirs of infection for a fresh outbreak at some subsequent date.

The disease is readily diagnosed on the clinical appearance and on the epidemic proportions it reaches.

Prevention and Treatment.

Prevention of a disease spread through such agencies as long grass and flies is difficult.

Fat-lamb raisers may be able to put their sheep on short crops or a mown pasture and in this way obviate further spread by long grass. This, of course, could not be carried out in the pastoral districts.

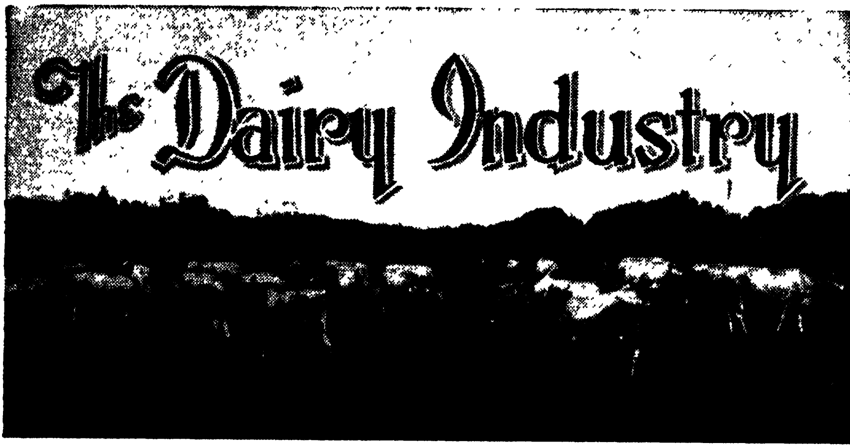
In some experiments carried out recently in the Blackall district a light covering of the head and face of sheep with a fine spray of 1 per cent. D.D.T. used in the form of "Rucide" was reported to reduce bush-fly worry of rams for about three weeks and this might be worth considering in the case of stud sheep which are being hand-fed for show purposes.

More recent work indicates that one part of the drug sulphacetamide mixed with two parts of boracic acid is the most satisfactory treatment. This is used as a dry powder and blown into the affected eye with a De Villoiss powder blower (No. 118).

SHELTER FOR STOCK.

Much can be done to provide shelter for stock by planting trees of suitable type on chosen positions on holdings. Pines and cypresses constitute very useful protection for the purpose and make reasonably quick growth. To obtain the maximum amount of value from those trees, however, they should be fenced off from stock in order to protect the lower branches (which are most important as breakwinds) from becoming eaten or broken off. In bad weather animals will of their own accord take advantage of this form of shelter, as protection from the prevailing cold winds. In the case of lambing ewes, in very severe weather the fence can, if desired, be taken down and the sheep allowed access to the plantation for a day or so without doing any great amount of harm to the trees.

Improvised fences make valuable breakwinds for sheltering stock, and sheds of various descriptions can also be made use of to great advantage. The experience of owners who have used sheds is that there is no difficulty in getting sheep, particularly shorn sheep, to take advantage of them.



Effect of Month of Calving on Production.

S. E. PEGG, Senior Adviser (Herd Testing).

THE month of calving is important in determining the production of dairy cows in Queensland.

In order to ascertain the effect of the month of calving and to indicate which months are the most profitable for calving, a survey has been made of all the grade herd testing records available. Unfortunately, all records prior to 1939 were destroyed some years ago, so the survey was conducted on all completed lactations of 150 to 273 days, recorded from 1939 to 1947, for all Queensland except the Atherton Tableland, where the figures used were from 1934 to 1942.

The survey of some districts showed that the number of recorded lactations for some of the months was not sufficient to give reliable figures.

The average production for the month of March for the Downs had to be calculated from only 19 lactations and this probably accounts for the average for that month being much higher than the averages for February and April.

Similarly, the number of lactations for Central Queensland was small for most months—particularly for February, March and April. This probably accounts for the low average production for March and April.

The period of 8 years includes a wide range of seasonal conditions; therefore the effects of good and bad seasons offset each other.

The survey reveals that in many districts the average production of cows calving in July, August and September is 40 to 50 lb. more than cows calved in the first quarter of the year. The most profitable period for cows to calve varies slightly according to districts.

Dairy farmers should give serious thought to controlling the calvings of their cows in order to obtain the maximum production from each cow. If a cow's production can be increased by 40 lb. of butter fat by calving in July instead of March, why not take advantage of this fact? 40 lb. of butter fat is equal to 48¾ lb. of commercial butter

and at 2s. per lb. commercial butter, this equals £4 17s. 6d. What a difference it would make to the dairymen's income if all cows calving in the first quarter of the year were to calve in July and return their owners an extra £4 17s. 6d. per head!

The general practice in Queensland has been to distribute calvings throughout the year.

There are several reasons for this, some of which are:—

(*a*) At one time there was a demand by the industry to maintain even shipments of butter to Britain throughout the year.

(*b*) Prior to equalisation of prices, there was a higher price paid for butter produced during the winter months. This influenced autumn calvings.

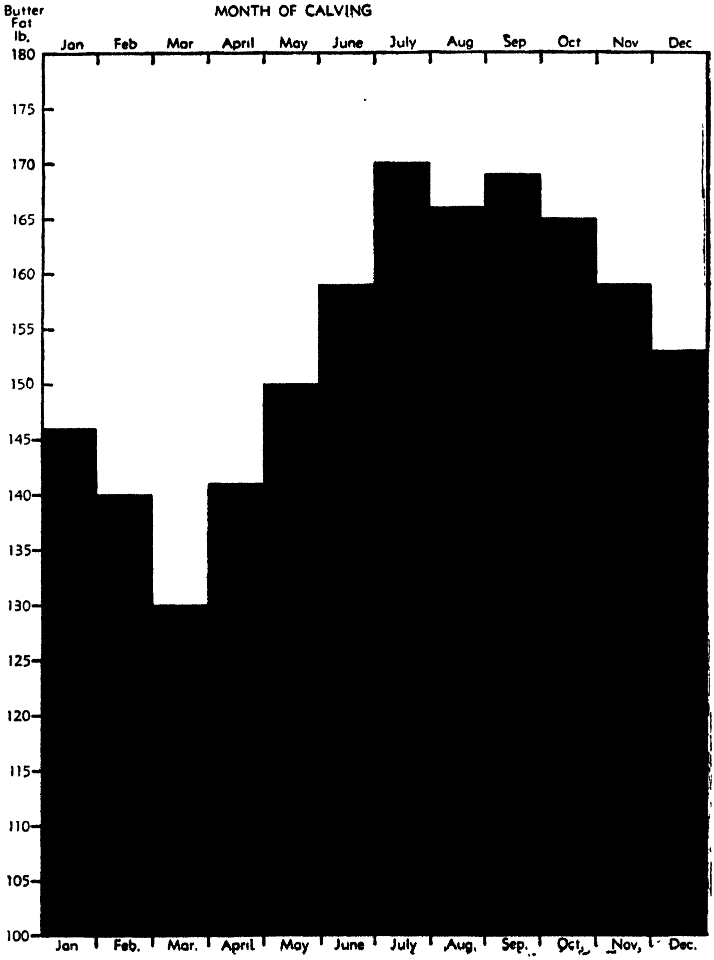


Plate 58.

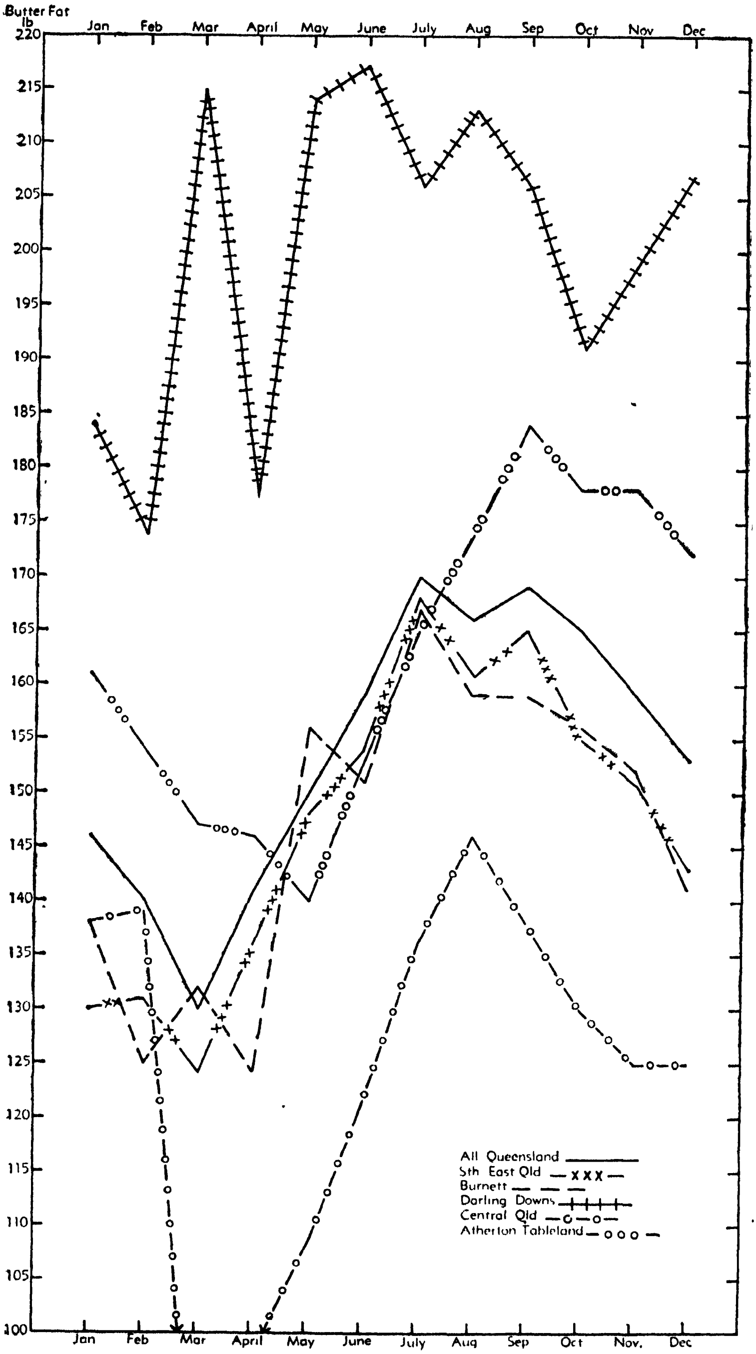

Butter Fat lb
Jan Feb Mar April May June July Aug Sep Oct Nov Dec
220 215 210 205 200 195 190 185 180 175 170 165 160 155 150 145 140 135 130 125 120 115 110 105 100
All Queensland
Sth East Qld — x x x —
Burnett — — —
Darling Downs
Central Qld — o — o —
Atherton Tableland — o o o —
Jan Feb Mar April May June July Aug Sep Oct Nov. Dec

Plate 59.

TABLE 1.

District.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Average and Total.	—
All	146	140	130	141	150	159	170	166	169	165	159	153	157	Average yield butterfat
Queensland	923	556	495	522	563	707	819	723	976	1,310	1,086	907	9,587	Number of lactations
	9·63	5·8	5·16	5·44	5·87	7·37	8·54	7·54	10 09	13·66	11·33	9·46	. .	Per cent. of lactations
South-east	130	131	124	136	148	154	168	187	165	155	151	143	150	Average yield butterfat
Queensland	351	259	174	196	213	310	332	404	423	451	485	400	3,947	Number of lactations
Burnett . .	138	125	132	124	156	151	167	159	159	156	152	141	149	Average yield butterfat
	155	96	84	73	80	110	132	168	174	173	194	176	1,615	Number of lactations
Downs . .	184	174	215	177	214	217	206	213	206	191	199	207	202	Average yield butterfat
	47	24	19	29	36	55	70	73	62	57	66	40	578	Number of lactations
Central	138	139	79	97	103	121	136	146	138	130	125	125	129	Average yield butterfat
Queensland	24	15	9	14	24	18	24	47	56	68	53	28	380	Number of lactations
Atherton	161	154	147	146	140	153	165	174	184	178	178	172	164	Average yield butterfat
Tableland	292	178	173	176	180	157	214	202	224	266	248	219	2,529	Number of lactations

(c) Factory managers claimed that if farmers maintained even production throughout the year it would enable them to keep down manufacturing costs. This has not worked out according to plan, as it has resulted in a big flush of production in January and February. By all cows calving in July, August and September, it would give the factories a slack period of little or no manufacture during the months of May and June. This would enable the factories to do the much needed annual repairs and overhauls and would also allow their staff to take their recreation leave at the slack period without inconvenience.

Table 1 shows the average production for cows calving in each month in the various districts.

The influence of season of calving is more clearly seen from Plates 58 and 59.

10,000 Milk Smears.

AILEEN M. DELANEY* and PATRICIA M. NAGLE, Dairy Research Laboratory.

ONE of the functions of the Dairy Research Laboratory is the microscopic examination of low-quality raw milks received at Brisbane pasteurizing depots. Each supplier's milk is subjected to the methylene blue test twice weekly, and a smear made of each milk decolorizing the methylene blue within three hours between October and March, and within four hours between April and September. Such smears are made by extracting from the decolorized milk samples less than a drop of milk by means of a sterile platinum wire and placing it on a glass slide to dry. All smears made at the depots are forwarded to the Dairy Research Laboratory where they are stained and examined with a microscope.

According to the types of organisms found on a smear, the reason for the low quality is determined. The sources of contamination, and consequently of low quality, are broadly classified as follows:—

A. Utensil contamination.

B. Environmental contamination.

C. Addition of aged or stale milk.

D. Udder trouble.

The word "utensil" is to be understood in a very broad sense, and is designed to include all dairy equipment with which the milk comes in contact.

The results of the microscopic examination of 10,000 milk smears reveal that the "percentage" causes of low quality were distributed according to the following table:—

A.B.	(Utensil and environmental contamination)	74·4 per cent.
C.	(Addition of aged or stale milk)	10·0 per cent.
D.	(Udder infection)	14·3 per cent.
Unclassified	.. ..	1·3 per cent.

* Now on the staff of the Brisbane Hospital.

A and B have been grouped because of the difficulty in determining whether contamination has been picked up directly from utensils or from dust-contaminated utensils.

The foregoing percentages are illuminating, and demonstrate in no uncertain terms the main reasons why milks fail to make the methylene blue grade. It cannot be too often emphasized that the three main essentials of quality milk production are—

1. Hygienic methods.
2. Efficient cooling.
3. Healthy cows.

Pure Bred Production Recording, 1946-47.

S. E. PEGG, Senior Adviser (Herd Testing).

PURE bred production recording was greatly affected by the dry weather which prevailed during the latter half of 1946. This resulted in a large number of cows being withdrawn from test, namely 37 per cent.

One of the rules governing the test is that 25 per cent. of registered cows must be tested, but in many cases this was not adhered to because of the dry conditions.

708 cows were due to complete their test during the period from 1st July, 1946, to 30th June 1947; of these 366 cows (51.7 per cent.) passed the standard required for entry into the Advanced Register of the several herd books, 80 cows (11.3 per cent.) did not reach the required standard, and 262 cows (37 per cent.) were withdrawn from test.

The following table gives the figures for each breed:—

Breed.	Number of Cows.		Withdrawn.	Total.
	Passed.	Failed.		
A.I.S.	128	34	131	293
Jersey	227	37	115	379
Ayrshire	3	3	13	19
Guernsey	6	6	3	15
Friesian	2	..	..	2
Totals	366	80	262	708

The attached table gives the averages for the various ages of each breed.

PURE BRED DAIRY CATTLE PRODUCTION RECORDING SCHEME.

Breed Production Averages for Registered Herd Book Stock which Completed Lactation Records of 273 Days during the Year ending 30th June, 1947.

—	Ages of Groups.							
	J2.	S2.	J3.	S3.	J4.	S4.	M.	All Ages.
A.I.S.—								
Number of Cows	41	34	23	16	4	6	38	162
Lb. Milk	6,959·97	6,433·6	8,188·38	8,528·37	8,855·85	8,948·33	8,360·63	7,775·45
Lb. Butterfat	284·296	300·571	339·732	334·328	371·586	343·021	368·563	324·621
Test per cent.	4·08%	4·67%	4·15%	3·92%	4·20%	3·83%	4·41%	4·17%
Jersey—								
Number of Cows	97	32	28	17	15	12	63	264
Lb. Milk	5,322·07	5,016·43	5,514·71	6,293·13	7,063·49	6,475·59	7,320·97	5,996·37
Lb. Butterfat	280·776	305·304	332·578	330·220	367·461	341·735	348·462	324·867
Test per cent.	5·28%	6·09%	6·03%	5·25%	5·2%	5·28%	5·25%	5·42%
Ayrshire—								
Number of Cows	Nil	1	1	2	Nil	Nil	2	6
Lb. Milk	..	5,770·85	7,357·9	8,750·3	..	..	9,365·73	8,226·8
Lb. Butterfat	..	273·439	306·027	338·726	..	..	412·221	346·893
Test per cent.	..	4·74%	4·16%	3·87%	..	..	4·4%	4·25%
Guernsey—								
Number of Cows	3	2	4	1	Nil	1	1	12
Lb. Milk	6,740·17	5,373·77	5,893·75	5,677·75	..	10,312·5	10,606·25	6,761·76
Lb. Butterfat	344·633	272·347	320·425	303·805	..	497·771	511·715	347·798
Test per cent.	5·11%	5·07%	5·44%	5·35%	..	4·83%	4·82%	5·14%
Friesian—								
Number of Cows	2	Nil	Nil	Nil	Nil	Nil	Nil	2
Lb. Milk	8,670·33	..	..	..	..	..	..	8,670·33
Lb. Butterfat	308·389	..	..	..	..	..	..	308·389
Test per cent.	3·56%	..	..	..	..	..	..	3·56%

All Ages and All Breeds—Number of Cows, 446; Lb. Milk, 6,580·06; Lb. Butterfat, 325·617; Test per cent., 4·84.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which qualified for entry into the advanced register of the A.I.S., Jersey, Ayrshire and Guernsey Societies' Herd Books, production records for which have been compiled during the month of February, 1948. (273 days unless otherwise stated.)

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	MATURE COW (STANDARD 350 LB.).			
Mountain Camp Dahlia	W. D. Davis, Chinchilla	11,992·0	490 108	Lawndale Victor
Navillus Tiddlewinks 8th	E. W. Jackson, Nobby	13,234·6	421·261	Greyleigh Eros
Merridale Dell	Giles Bros., Woowoonga	9,347·05	387·914	Merridale Gentle's Reflection
Lynfield Fay 2nd	A. C. Marquardt, Mondure	11,028·85	378·315	Parkview Ransom
Merridale Stella	Giles Bros., Woowoonga	10,756·8	355·985	Merridale Gentle's Reflection
	SENIOR, 4 YEARS (STANDARD 330 LB.)			
Alfa Vale Queenie	W. H. Thompson, Nanango	14,742·15	562·021	Reward of Fairfield
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Tabbagong Pet 4th (365 days)	J. Crookey, Allora	14,225·75	538·86	Park View Ensign
Navillus Violet 13th	C. O'Sullivan, Greenmount	9,390·7	347·967	Park View Limerick
Bunyaview Charm	K. Berghofer, Westbrook	6,664·8	333·334	Trevor Hill Reflection
Rhodesview Dolly 2nd	K. Berghofer, Westbrook	8,476·8	320·195	Fairvale Major
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Rhodesview Fanny 54th	K. Berghofer, Westbrook	7,639·74	338·983	Rhodesview Neal
Ardilea Bud	W. Hinricksen and Sons, Clifton	7,798·35	328·955	Newstead Reliance
Glen Idol Miss Jean 2nd	Estate P. Doherty, Gympie	8,606·45	320·602	Blacklands Count
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Bunyaview Duchess 4th	K. Berghofer, Westbrook	8,757·78	388·727	Trevor Hill Reflection
Balatar Maiden	F. W. Fowler, Felton	8,727·5	345·593	Fairvale Dairyman
Palmetto Velvet	R. Tweed, Kandanga	6,569·1	307·161	Sunnyview High Caste
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Glen Idol Princess 2nd	Estate P. Doherty, Gympie	7,873·5	309·659	Glen Idol Regent
Yarranvale Blossom	K. Berghofer, Westbrook	8,488·42	295·164	Alfa Vale Pride 10th
Yarranvale Blue	K. Berghofer, Westbrook	5,940·17	266·627	Sunnyview Royal National
Yarranvale Kitty 3rd	K. Berghofer, Westbrook	6,002·02	262·008	Alfa Vale Pride 10th
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Springlea Lovely 7th	J. E. Heath, Murgon	9,046·2	336·874	Alfa Vale Standard
Lynfield Golden 3rd	A. C. Marquardt, Mondure	9,577·9	332·343	Parkview Ransom
Faversham Daisy 5th	W. D. Davis, Chinchilla	8,279·2	326·044	Croyden Marchese
Trevor Hill Hope 4th	E. G. Brennan, Wyreema	7,768·39	316·474	Trevor Hill Bosca
Bantry Nectar	D. Sullivan, Pittsworth	8,330·1	299·173	Rosenthal Surplus 2nd
Navillus Countess 5th	C. O'Sullivan, Greenmount	8,542·0	297·1	Parkview Limerick
Ennismore Rosemarie	E. W. Jackson, Nobby	6,981·65	267·187	Navillus Prince Henry
	JERSEY.			
	MATURE COW (STANDARD 350 LB.).			
Palmridges Iritis	H. Sigley, Jaggan	8,978·75	447·346	Oxford Leanda
Fauvic Recoil	H. Cochrane, Kin Kin	6,893·15	421·851	Shepstone Gallant Lad
Palmridges Jesma	H. Sigley, Jaggan	6,469·35	416·533	Palmridges Don
Glenrandle Golden Lotus	P. Kerlin, Killarney	7,083·0	395·978	Bellgarth Stylish
Inverlaw Sirius	R. J. Crawford and Sons, Kingaroy	7,781·95	382·825	Oxford Royal Lad
Jersey Park Hope	J. McCarthy, Greenmount	6,958·10	367·084	Banule Woft
Rosalien Nellie	J McCarthy, Greenmount	6,383·65	361·597	Woodside Par

	SENIOR, 4 YEARS (STANDARD 330 LB.).			
Glenrandle Handsome Lady	P. Kerlin, Killarney	6,208·2	371 668	Bellgarth Stylish
Pineview Princess 4th	F. C. Leschke, Wanora	7,109·25	365·571	Pineview Lora's King
Pineview Golden Daisy	F. C. Leschke, Wanora	6,720 45	355·089	Pineview Lora's King
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Hillsdale Babe	A S. Grant, Greenwood	7,706·15	336·692	Bryn-hyf-ryd Courtier
Glenside Roselea	F. Z. Eager, Neurum	6,474·3	325·725	Glenside Prophet
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Boree Cute Buttergirl	W. and C. E. Tudor, Gayndah	6,989·97	354·326	Trinity Cute Commodore
Glenrandle Fashion Lady	P. Kerlin, Killarney	5,853·8	353·892	Bellgarth Stylish
Lawnview Ada	W. A. Berderow, Fairney View	6,352·8	336·353	Oxford Maxie
Glenrandle Verabelle	P. Kerlin, Killarney	5,792·5	328 327	Bellgarth Stylish
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Navua Beauty Boutilliere 3rd	P. J. L. Bygrave, Aspley	6,728·79	350·691	Navua Mighty Volunteer
Glenrandle Tiny	P. Kerlin, Killarney	5,953 0	338 947	Bellgarth Glory King
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Westbrook Tulip 135th	Farm Home for Boys, Westbrook	7,281 1	375 981	Mornmoot Clementine's Valour
Boree Cute Princess	W. and C. E. Tudor, Gayndah	7,393·37	337 703	Trinity Cute Commodore
Rosalie Midge	G. V. Tilley, Beaudesert	6,751·1	311 071	Rosalie Premier
Hillsdale Dewdrop	A. S. Grant, Greenwood	5,125·65	270 84	Bryn-hyf-ryd Courtier
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Oxford Madge	F. C. Leschke, Wanora	6,195 6	336·866	Glenside Golden Victory
Lawnview Molly	W. A. Berderow, Fairney View	5,938 8	330 684	Oxford Maxie
Lermont Model 2nd	J. McCarthy, Greenmount	5,164 8	330 107	Trinity Noble Effort
Grasmere Monash Semola	F. Z. Eager, Neurum	6,799·15	326 628	Kingsford Monash
Glenrandle Lulu	P. Kerlin, Killarney	5,825·9	319 382	Oxford Noble Peer
Glenrandle Lena	M. J. Kerlin, Killarney	5,436 6	307 553	Oxford Noble Peer
Glenrandle Jerseymaid	P. Kerlin, Killarney	5,969 2	307·49	Bellgarth Glory King
Romsey Dainty Spot	J. Wilton, Killarney	5,657·2	306 592	Oxford Pixies Victor
Glenrandle Spotted Lady	P. Kerlin, Killarney	4,570·2	264·502	Oxford Noble Peer
College Florette 10th	Queensland Agricultural High School and College, Lawes	5,213 15	259 522	Westbrook Ambassador 52nd
Lermont Gaylass	J. Schull and Sons, Oakey	4,417·2	242 132	Trinity Graceful Duke
	AYRSHIRE			
	SENIOR, 3 YEARS (STANDARD 290 LB.)			
Leafmore Greta Garbo	J. P. Ruhle, Motley	7,250 0	312 195	Leafmore Bonny Jock
	GUERNSEY.			
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Bangalow Vale Sunset	W. A. K. Cooke, Witta	5,936 4	334 205	Yarraview Factor

New Beekeeping Legislation.

"THE APIARIES ACT OF 1947."

J. A. WEDDELL, Entomologist, and C. R. R. ROFF, Inspector, *Apiaries Act*.

How the Act Developed.

THE control of beekeeping in Queensland by legislation dates from 1931, when the first *Apiaries Act* was passed. The primary purpose was to give power to deal promptly and adequately with outbreaks of diseases of bees. A natural addition to this was a system of approving and registering apiaries so that inspections for disease would be simplified. It was also required under the Act that any bees or beekeeping materials introduced into the State should be first certified as being free from disease. These basic principles were continued in *The Apiaries Act of* 1938 but, in addition, a certain degree of control of the industry was then included to prevent overstocking of localities or encroachment between apiaries in south-eastern Queensland, where the greater proportion of the apiaries of the State are located.

The degree of protection against encroachment under the Act of 1938, however, proved to be excessive, as relatively small apiaries could hold territory that was capable of carrying a greater number of hives and, consequently, of yielding a much larger crop of honey. New apiaries were required to be established further apart than is now considered necessary and there was thus a tendency also to exclude migratory beekeepers from potentially profitable areas. When a flow is on, good beekeeping country can profitably carry a far greater number of hives than was previously thought to be the case in Queensland. This has been substantiated by instances in this State where beekeepers, by mutual consent as was allowed for under the Act, positioned large apiaries at very short distances apart without detrimental effects. Similar action in the poorer beekeeping country would of course have caused overstocking, but the good business sense of beekeepers would normally prevent this from happening.

To correct the various shortcomings referred to, *The Apiaries Act of* 1947 was passed. This Act is to come into force on 31st March, 1948, and the following explanation of the Act should enable all beekeepers to become conversant with the requirements. The Act is divided into parts and, for convenience, it will be discussed here under headings relating to requirements in declared districts, to the control of disease in the State as a whole, to the prevention of the introduction of disease and also to some general provisions.

Requirements in Declared Districts.

The pastoral districts of Moreton, Darling Downs, Wide Bay and Burnett have been declared as districts for the purposes of Part II. of the *Apiaries Act*. Within this area of south-eastern Queensland a system of registration has been provided which is somewhat different from that under the old Act.

On 31st March in each year, every beekeeper, whether he has one hive or a hundred, must apply for registration and in doing so must supply certain information on a prescribed form regarding his apiary or apiaries. At a later date, he will receive his certificate of registration for the period up to 31st March in the following year. No person is permitted to keep bees unless he applies for registration as a beekeeper. No fees are to be charged under the new Act.

Unless an inspector decides that a locality has become grossly overcrowded, no restrictions will be imposed on the placing of apiaries consisting of less than forty hives, and for convenience these apiaries will be known as Apiaries Class A. Apiaries Class B will be those consisting of forty hives or more. The minimum distance between apiaries of this class has been set down as half a mile.

In addition to the classes already mentioned, two further classes have been established.

An Apiary Class C is one consisting of at least forty hives in which queen bees are bred for sale. A certificate indicating that an apiary is an Apiary Class C will be issued only after the inspector has certified that the apiary is suitable for the purpose. The benefit to be derived from this particular classification is that no other beekeeper will be allowed to commence a new apiary within a radius of one mile of an Apiary Class C. This restriction is provided to help the commercial queen-breeder to maintain the purity of his strain, but it may be noted that any apiary already established within the prescribed limits will not be affected. The holder of a certificate for an Apiary Class C may, however, give consent for any person to establish an apiary within the one-mile radius, subject always to Departmental approval.

Certain apiaries consisting of forty hives or more may be classified as Apiaries Class D. The site of such an apiary is intended to be available as a protected site in the event of the beekeeper desiring from time to time to leave it to follow a honey flow. Before a certificate will be issued, the beekeeper concerned must possess a total of at least one hundred and fifty hives, and in effect the site must be one that the inspector considers to be a suitable and convenient centre for that beekeeper's activities. The owner of an Apiary Class D may remove any or all of his bees from that site to any other site without loss of rights, and in the period between this action and the re-occupancy of this site it will be an offence for another beekeeper to establish an Apiary Class B within the half mile radius. However, in any certificate issued in connection with an Apiary Class D, conditions may be imposed to ensure that such a site is properly "worked" and that other beekeepers are not being unnecessarily restricted in that area. Certificates may be revoked at any time and the number of Apiaries Class D allotted to any one beekeeper will be determined by the Department.

A beekeeper having either an Apiary Class B or an Apiary Class D may give his written consent for any other beekeeper to establish an Apiary Class B or D at a distance of less than half a mile. If an

inspector, after considering the local situation, is of the opinion that the establishment of a new Apiary Class B or D would not prejudice an already established Apiary Class B or D, then permission may be granted for the new apiary to be established and maintained for some determined period.

If a beekeeper sells, establishes or removes an apiary, he must advise the Department of his action within fourteen days.

The keeping of bees on a site may be prohibited if any provision of the Act is being contravened or not complied with, or if the site has become unsuitable for beekeeping, or if the keeping of bees there is detrimental to public interest. Such a site would then become known as a prohibited apiary site. If any person establishes or maintains an apiary upon such a prohibited apiary site he will be guilty of an offence under the Act.

It now becomes necessary for each beekeeper to mark at least one hive in every fifty or part thereof with his registered brand number. This brand number will be supplied to each registered beekeeper on his certificate of registration. The marking must be in block letters and figures not less than two inches high and must always be maintained in a legible condition. The marking is to be placed on the front of the hive, and at least one of the hives marked shall be situated in the front row of hives.

Control of Disease Throughout Queensland.

The part dealing with the control and restriction of diseases and pests affecting bees is by far the most important portion of the Act and it is to be in force throughout the whole State.

Linked with inspectional work is the necessity to have good facilities for examining hives, and as a result beekeepers are required to keep their bees in frame hives maintained in good condition. A badly constructed or neglected frame hive makes effective examination for the presence of disease very difficult.

In the event of a beekeeper noticing a disease in his apiary, he must notify the Department immediately; further, he must not sell or in any way dispose of any bees or materials while they are affected with or liable to spread disease.

Under the Act power is given to the Minister to order the destruction of any diseased bees or disease-affected material. However, such action will follow only if the inspector has certified that in his opinion the diseased apiary is a source of danger to other bees and ought to be destroyed and if his certificate is countersigned by the Director, Division of Plant Industry.

Particular areas or buildings may be declared quarantine areas for the purpose of disease control. Until a quarantine is lifted, no person will be allowed to remove bees or beekeeping material into, within or out of the area.

In connection with disease control, samples may be taken by an inspector for investigation, vehicles stopped and inspected, consignments directed to a quarantine area for investigation, instructions given

regarding methods of treatment to be carried out and generally any other action may be taken or ordered that may be necessary to effect efficient control.

Queensland has been comparatively free from diseases in bees in the past and every endeavour must be made to keep it so in the future. The requirements relating to diseases were designed with this in mind, while at the same time it is hoped that normally they will involve very little inconvenience to the beekeepers.

Prevention of the Introduction of Disease.

In coastal Queensland and along the southern border, certain towns have been listed as places of entry. All bees, bee combs, beeswax, hives, honey and appliances coming into this State must come through one of these listed places. By "appliances" is meant gear or apparatus that has been used in beekeeping but it does not refer to new goods. The places of entry are Bowen, Brisbane, Bundaberg, Cairns, Clapham Junction, Coolangatta, Gladstone, Goondiwindi, Killarney, Mackay, Maryborough, Mungindi, Rathdowney, Rockhampton, Texas, Townsville, Wallangarra.

A consignment coming into Queensland must be accompanied by a declaration completed by the consignee and a certificate must be completed and signed by an approved officer in a Department in the State or country of origin corresponding to the Department of Agriculture and Stock in Queensland to the effect that the consignment comes from a disease-free district. A duplicate copy of this declaration and certificate shall, prior to the introduction, be forwarded to the Department of Agriculture and Stock, Brisbane.

Upon arrival at a place of entry the consignment may be directed to a quarantine area for examination and, if found to be affected by disease, it may be detained in quarantine and treated in accordance with instructions.

A consignment coming into this State without the necessary declaration and certificate shall be either returned to the sender or destroyed in quarantine.

Any consignment coming to the State through a place of entry and accompanied by a properly completed certificate of freedom from disease will not normally be delayed.

General Provisions.

A beekeeper may be required to furnish information regarding queen bees supplied by him or such statistics pertaining to beekeeping as an officer appointed under the Act may reasonably require of him.

In the event of an inspector being satisfied that any bees, hives or appliances have been abandoned and are neglected, he may take possession of them and dispose of them in a prescribed manner or in accordance with instructions from the Under Secretary. This provision may sometimes be very necessary, for an abandoned apiary could easily become a source of nuisance or danger to beekeepers in the locality.

Honorary field men may be appointed and when required to do so may inquire and report on registration of beekeepers, location of apiaries, classification of apiaries, keeping of bees in frame hives, contraventions of the Act or such other matters as may be thought necessary by the Under Secretary. Honorary field men must be registered beekeepers and appointment will automatically lapse if bee-keeping is relinquished by them.

The main provisions of the Act may be briefly summarized as follows:—

1. Beekeepers throughout Queensland must keep their bees free from disease and in frame hives to permit of effective examination.

2. Beekeepers in the declared districts must register, provide descriptions of their apiaries, maintain a distance of at least one-half mile between apiaries of forty hives or more, and display their brand number on their hives.

3. All introductions of bees, honey, &c., must be certified as having come from an area free from disease.

Plate 60.
WEIR UNDER CONSTRUCTION ON THE LOCKYER.

MARKETING

The Butter Marketing Board.

The election of six growers' representatives on The Butter Marketing Board for a period of three years from 1st January, 1948, resulted as follows:—

	Votes.
*Adolph Gustav Muller, Boonah	346
*August Hermann Bulow, Mulgeldie	339
Otto Ottosen Madsen, Yangan	243
*Thomas Flood Plunkett, Beaudesert	241
*James Purcell, Toowoomba	220
*James McRobert, Maryborough	212
*William James Sloan, Malanda	170
David John Caulley, Sexton	122
John Braithwaite, Burncluith	99
Cecil Ormsby, Buranda	92
Percival Kidd, Malanda	64

The Cheese Marketing Board.

The operations of The Cheese Marketing Board will be extended for a further period of six years from 1st January, 1948. The referendum on the question of the continuance or otherwise of the Board's operations resulted as follows:—

For continuance	100
Against continuance	17

Voting at the election of three growers' representatives on the Board for the three years term commencing 1st January, 1948, resulted in the return of the present members. Voting details:—

	Votes.
Malcolm McIntyre, Pittsworth	117
Reginald C. Duncan, Toowoomba	95
David Gabriel O'Shea, Southbrook	88
William Alfred Latham, Goomeri	51

Egg Marketing Board.

The election of five growers' representatives on The Egg Marketing Board for a period of three years from 1st January, 1948, resulted as follows:—

	Votes.
District No. 1.	
R. B. Corbett, Woombye	124
*C. J. Nielsen, Bundaberg	76
District No. 2.	
N. G. Seymour, Darra	105
R. E. Slaughter, Aspley	104
District No. 3.	
*E. C. Knoblauch, Upper Mount Gravatt	194
W. R. Kempson, Wynnum Central	111
District No. 4.	
*C. F. Kuss, Marburg (returned unopposed)	
District No. 5.	
*H. Obst, Shepperd	87
O. A. W. Evans, Warwick	75

World Output of Potatoes.

World output of potatoes is slightly below that of last year, and considerably below that of the 1935-39 period average. Preliminary estimates by the International Federation of Agricultural Producers for the 1947-48 season indicate a crop of almost 190,000,000 tons, which is 16 per cent. below the pre-war average, from an area of approximately 51,000,000 acres.

* Denotes sitting member.

GENERAL NOTES

Oat Crop Pool.

The Minister for Agriculture and Stock (Hon. H. H. Collins) announced recently that he had been advised that Queensland would be included in the arrangements made by the Commonwealth Government to establish a pool for the sale of 1947-48 oat crop. A guaranteed first advance payment of 3s. 6d. per bushel would be paid and additional payments would be made as the exportable surplus was disposed of. The Australian Barley Board, Adelaide, is the authority handling the oats on behalf of the Commonwealth Government and arrangements are now being made by this body to appoint an agent in Queensland for the intake of the crop.

Mr. Collins stated that Queensland oat growers who delivered to the pool would share in any profit resulting from the high export prices, and referred to a recent announcement by the Federal Minister for Commerce and Agriculture (Hon. R. T. Pollard) which indicated that the British Ministry of Food will accept up to 12 million bushels at a price equivalent to 11s. 6d. a bushel f.o.b.

The Australian Barley Board has advised that oats will not be purchased on Commonwealth Government account unless they are packed in good, sound, second-hand corn-sacks, that the oats must conform to a minimum standard quality and that growers will be required to hold their oats until advised by the agent of the Board to make delivery. Growers will be responsible for storage arrangements prior to trucking and for any cost incurred up to that stage.

Farmers Protected.

Purchasers of all kinds of medicines advocated for the treatment of animals and birds are fully protected under the Queensland Veterinary Medicines Acts administered by the Department of Agriculture and Stock.

Manufacturers of these products are required to register their preparations by lodging with the Registrar the full formula accompanied by labels and directions for use.

Every year registration is refused for many medicines. Exaggerated claims regarding those remaining on the approved list are prohibited. The perusal of the labels on the preparations now on the market will disclose a degree of modesty in claims for use of the preparations that was absent before the enactment of this legislation.

It would be an offence against the Acts to suggest that any preparation would prevent or cure cancer, tuberculosis, or contagious abortion.

A continual inspection is maintained of the goods being offered for sale, and samples are obtained many of which are subject to analysis. This legislation not only assists the cattle, pig and sheep men, but also protects the keeper of any horse, donkey, goat, dog, rabbit, poultry, pigeon or bird in captivity.

Veterinary Science Scholarships.

Following the institution of veterinary science scholarships in 1945 to provide for the recruitment of future appointees to the veterinary staff of the Department of Agriculture and Stock, five-year scholarships have been allotted to Messrs. W. R. Ramsay (Windsor), L. L. Callow (Mackay), M. D. McGavin (Ashgrove), J. N. Shelton (Emerald), and R. G. MacDonald (West End).

Under present arrangements, scholarship-holders are required to take the first, second, and third years of their course at the University of Queensland, and, in the event of the non-establishment of the Veterinary School at the Queensland University, they shall afterwards complete their course at the University of Sydney.

In addition, a two-year scholarship in veterinary science has been allotted to Mr. B. Parkinson (Tennyson). This scholarship covers the fourth and fifth years of Mr. Parkinson's course, which will probably be taken at Sydney University.

Rural Topics

Soil Fertility on the Dairy Farm.

Dairy farming can be hard on pastures unless precautions are taken to maintain soil fertility, particularly in respect to potash. Essential plant food, including potash, is removed from pasture paddocks by the grazing animals, and accumulates in the night paddocks or leaves the farm in the drainage from the milking sheds.

The accumulation of fertility in the night paddocks can be turned to good advantage by growing fodder crops in alternate years, and feeding these back on the outlying paddocks while the dung and urine left at the yards can be conserved by the installation of a manure pit where all the animals' excreta is collected. Farmers who have put in manure pits are most enthusiastic about the benefits obtained from spreading the liquid manure over the pastures. A pump is necessary to lift the manure from the pit, and periodical cleaning out is necessary to remove the sludge that accumulates at the bottom.

The usual method of distribution is to fit up some kind of tank on to a lorry and allow the liquid manure to discharge through a pipe on to a spreading-board beneath the outlet at the rear. As liquid manure corrodes iron work fairly rapidly, it is desirable to use brass fittings where practicable and to coat the iron-work with bitumen or tar.

Regular use of farmyard manure will reduce the annual fertilizer bill.

—*W. D. Andrew, M.Ag.Sc., Pasture Research Officer of the Victorian Department of Agriculture.*

Use Penetrating Oil.

A can of penetrating oil should be on every farm workshop bench, and should be used freely on rusted nuts and bolts that have to be unscrewed, on bushings and pins before removing, and, in fact, any part that is rusted or gummed badly. It should be applied at least an hour before the part has to be removed. It can be purchased or made of equal parts of turpentine and kerosene, with a little denatured alcohol added.

Feeding the Dry Cow.

The few weeks that dairy cows are out of production is a most important period. During this time, the cows must not only replace body tissues lost during the previous lactation, but also build up reserves for their next lactation. During the first few weeks after calving cows may not receive sufficient nutrients to provide for the amount of milk they are producing. They are then said to be "milking off their backs" for they must draw on body tissue for milk production and in consequence they lose flesh.

When a cow calves in low condition she has to produce milk and build up her strength at the same time and, as a result, production suffers. All cows should be in good condition at calving.

The necessity to hand-feed dry cows, frequently referred to as "steaming up," will depend primarily on the season. Given good autumn rains there may be sufficient green feed in the paddocks to make it unnecessary to provide a supplementary ration. However, if pastures are short, and particularly during the winter, enough additional feed in the form of silage and hay should be fed to keep the cows in the desired condition.

Since supplementary fodders of all kinds will be in short supply on most farms, cows which may have been dry for a considerable period and are already carrying a reasonable amount of flesh should be allowed only sufficient feed to maintain their condition.

GADGETS AND WRINKLES

"Penetration" Method of Laying Cement.

The cement penetration method of laying cowyard and other floors has particular merit in these days of cement and labour scarcity. Compared with ordinary pre-mixed concrete, it takes about one-third less cement and is not nearly as laborious as the orthodox method.

Officers of the Victorian Department of Agriculture point out that, with this system, the metal or coarse aggregate is spread in a regular layer over the area to be concreted. The foundation needs to be solid and level. The metal should be free of dust, and laid to a depth of about 4 inches. The size of the metal should not be less than 1 inch-2 inch or 2½ inch metal is recommended. Small metal compacts, when rolled, thus preventing the penetration of the cement grout. The metalled surface is thoroughly rolled or tamped, and sprinkled with water so that the dry stone will not absorb water from the cement mixture.

It is then penetrated with a grout mixture consisting of 1 part of cement to 3 parts of fine clean sand, with sufficient water to make a thin creamy emulsion, which is poured over the metal to flush the layer of metal to the surface, and this will completely fill all the intervening voids and spaces. After about 30 minutes, the penetrated surface is coated with a layer of about ½ inch of a stiff grout consisting of 1 part cement to 2½ or 3 parts of sand, mixed in the ordinary way and worked into place by the usual screeding. After about an hour, it can be hand-trowelled. Construction joints, if desired, can be made by cutting through the penetrated surface with an axe before the top layer of stiff grout is laid. The top layer will fill the joints cut with the axe. A jointing tool can then be used to cut through the full thickness of the mass, thus completely separating the slabs. With this method the maximum amount of stone is incorporated into the floor with a minimum of sand cement mixture. The work calls for no great skill beyond the experience of the average handyman.

"Don'ts" for Pig Producers.

DON'T firebrand on valuable part of pig. Body tattooing is best. If you must firebrand, do so on the back of the neck and use a small brand.

DON'T feed pigs on morning of despatch, but provide plenty of clean water.

DON'T use faulty races.

DON'T kick pigs.

DON'T prod with sticks.

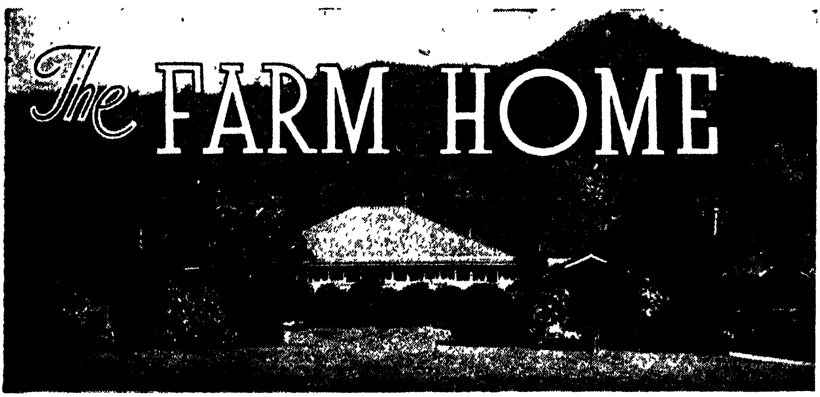
DON'T drive pigs with whips, sticks, or wire.

DON'T load pigs in dirty trucks.

DON'T overcrowd pigs in trucks.

Firebranding, bruises or lacerations impair the market value of the finished carcase and result in its rejection for export. Producers, agents, drovers, abattoir employees, railwaymen and saleyard authorities are urged to co-operate in preventing these and other injurious practices.

Careless Handling Means POOR TRADE, LOWER PRICES, DAMAGED REPUTATION.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

THE GROWING CHILD AND HIS FOOD.

LAST month we gave some suggestions for training the baby to eat solid foods. Now we must consider in more detail the food requirements of children. The bodies of children are built up from the food they eat, and if the wrong foods are given their bodies will be poorly developed—the bony structure will not be strong and the muscles lacking in tone. In addition, badly fed children are easy victims of all kinds of infections, and one finds that they tire very easily, are always ailing, and soon help to crowd both the wards and the out-patients' department of our hospitals.

For adequate growth and good health every child must have sufficient food to supply his needs for energy and heat, and *most importantly* a good quantity of body-building food. The foods which build the body are called proteins, and the best proteins are found in foods from animal sources, milk, cheese, eggs, meat, and fish. There is some protein in our cereal foods, such as bread and porridge, and a certain amount in some vegetables, particularly peas and beans and potatoes, but the cereal and vegetable proteins are not such effective body builders as the animal proteins.

Owing to lack of knowledge of the value of foods and certain wrong ideas about the protein needs of adults, many children have far too much bread and jam and cake and sweets, and far too little body-building food. It may surprise many parents to know that a boy and girl of ten years of age needs as much protein as a grown man; after that age the needs of a boy are rather higher than those of a girl, and at age 16 both boys and girls need *more protein*, especially the milk, egg, and meat proteins, than a grown man. If father does manual work he needs extra energy food, but not as much protein as his young son and daughter, because he is fully grown and they are not.

Young bones have to be built up and hardened by a mineral we call calcium or lime, and the best source of this is milk. A fair quantity is contained in green leafy vegetables. Iron for making red blood is found in liver, egg yolk, and some vegetables and fruits. Most people have heard of vitamins. These are good factors which help the body to use foods properly and so get all the benefit from them. If children have the foods already mentioned, and their bread and porridge is made of whole wheatmeal or oatmeal and they eat wholemeal bread with their full ration of butter, they should obtain enough of all the vitamins.

Appetite.

The well child offered a good mixed diet, well cooked and nicely served at regular intervals, will have a good appetite. If his appetite becomes poor, be sure that he is having sufficient rest, fresh air, sunshine, and exercise, and is in good physical condition. The doctor at your local Toddler's Health Centre or your family doctor should be consulted if poor appetite persists.

Any further advice on this and other matters connected with children may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters *Baby Clinic, Brisbane*. These letters need not be stamped.

IN THE FARM KITCHEN.

Tomato Soup.

One and a-half pints bottled tomatoes, 2 teaspoons sugar, ½ pint water, 2 tablespoons fat, 2 tablespoons flour, 2 cloves, salt and pepper to taste. Turn tomatoes into a saucepan. Add water, sugar, cloves, and cover. Simmer for 20 minutes. (Pick out cloves.) Rub through a sieve. Melt fat. Add flour. Stir till turning colour, then add soup gradually, but stirring constantly. Heat to boiling point. Season with salt and pepper. For four persons.

Pumpkin Soup.

Two breakfast cups cooked mashed pumpkin, 2 pints milk, 1 pint water, 3 tablespoons flour, 1 tablespoon butter, 1 onion, 1 piece celery, salt, pepper, nutmeg. Mince the peeled onion and the piece of celery, place in basin and pour the boiling milk and water over them. Leave ten minutes. Put the pumpkin into a saucepan, stir in the butter and flour, beat well together. Add the seasoning, being careful not to overdo the grated nutmeg. Strain the milk free from celery and onion, pour over the mixture in saucepan, stir thoroughly, and cook gently for 15 minutes. Try this soup with vegetable marrow instead of pumpkin, but at the last moment before serving the secret is to add three tomatoes halved and fried.

Bacon Balls.

A few slices of fat bacon and pieces of the crumb of the bread (about the size of a walnut), 1 hard-boiled egg, pepper and salt. Remove the rind of the bacon and dip the pieces of bread into hot dripping. Wrap a piece of bacon around each piece of bread, and secure with a tiny skewer. Fry in the usual way, and dish heaped up, and surrounded with fried potatoes. Sprinkle with chopped parsley and grated hard-boiled eggs.

Savoury Potatoes.

Three large potatoes, cooked meat, chutney or pickle. Wash and dry potatoes and bake in their jackets. When cooked make an opening in centre, scoop out a little potato, mix with finely chopped meat, and flavour with chutney or pickle. Fill potatoes, reheat in oven and serve hot.

Candied Orange Peel.

Take the peel of two oranges, cut it in sections and remove as much as possible of the pith. Then cover with cold water, bring up to the boil and cook slowly until soft. Drain, then cut the peel into thin strips, and put them into a saucepan with ½ cup of sugar and ½ cup of cold water. Bring to the boil and boil for about 20 minutes. Cool on a plate and roll in granulated sugar.

Lightning Layer Cake.

Three ounces butter, 4 oz. sugar, 2 teaspoons baking powder, lemon essence to taste, 1½ teacups flour, 2 eggs, pinch of salt, milk as required. Beat sugar and butter to a cream. Beat eggs and turn into a teacup and fill up with milk. Add to the sugar and butter and beat well. Sift flour with baking powder and salt, and lightly stir into other mixture. Beat well and add lemon essence to taste. Divide equally between two greased sandwich tins. Bake in a moderately hot oven for about 25 minutes. Stand for two minutes after removing from oven, then turn out gently on to a lightly-sugared paper. When cold, sandwich with jam and spread top with chocolate icing if possible.

QUEENSLAND WEATHER IN FEBRUARY.

During February the Peninsula North District received slightly over average seasonal rains, and the Warrego and Far South-west areas benefited by variable storms in the middle of the month, as well as during the last few days. These two districts averaged 294 and 433 points, respectively, and in the adjacent Lower West average distribution of 195 points was recorded. All other districts were below average, though Central Coast East and West Divisions registered useful to local heavy totals from the 8th to the 10th. In general, the dry conditions of January continued over most of the State until the end of the month, and it was not until the 23rd that belated activity in the northern tropical air belt penetrated southward into the Gulf of Carpentaria. This intermittent southward movement continued and ultimately fairly useful to local heavy rains were recorded in many districts of the State in the last two days of the month. In the agricultural and dairying districts of the south-eastern quarter and central coast areas considerable relief was afforded rapidly drying areas and the unusual risks of bush and grass fires were eliminated. Some central interior areas and parts of the Central Highlands missed the main distribution and have had little or no useful rain since December, and these districts need early and soaking rains. In the North-west and Carpentaria further rains of a variable nature in the first few days of March should be beneficial, and in the South-west the over-average falls of February were also supplemented by many one to two inch totals.

Pressure.—On the 18th a cyclonic storm developed off the north-west coast of Western Australia and this storm ultimately brought widespread floods over inland Western Australia. Greater activity in the tropical warm front over northern waters developed into the first inland monsoonal movement of the year, and a shallow circular formation was shown in the Gulf of Carpentaria on the 23rd. This drifted south-west into the Northern Territory and through the central interior of the Continent. During this period a steady North-East to North circulation of warm, moist air was maintained in Queensland, and on the 28th the central interior shallow depression was shown lying to the east of Alice Springs, with cold front movements approaching through South Australia. These controls moved east and during the 28th-29th brought useful to relief rains over most of the State.

Moderate seas with north-east winds were reported on parts of the central and south coasts 25th to 29th. On the 1st a tornadic squall caused structural damage at Aramac.

Temperatures.—Maximum temperatures, except Cairns, generally above average from 0 5 deg. at Thargomindah to 4.9 deg. at Boulia, 4.8 deg. Camooweal, and several others approximately 3 to 4 deg. Minimum temperatures were mostly below normal along the coast. In the central-west and upper west, however, averages were above normal from 1.8 deg. at Cloncurry to 4.1 deg. at Boulia, while Mitchell was also 3.1 deg. above normal. Days over 100 deg.: Boulia 28, Winton and Urandangle 24, Richmond 22. Highest daily temperature Camooweal 111 deg. (6th), Windorah 111 deg (5th). Lowest screen minimum Stanthorpe 49 deg. (16th). Minimum temperatures over 80 deg. Boulia 13 nights, Cloncurry 10, Quilpie 7, Isisford 7.

Brisbane.—Mean pressure $\frac{9 + 3}{2}$ 29 946 ins, Normal 29.903 ins *Temperatures.*—Mean maximum 83.1 deg., normal 84.3 deg.; mean maximum 68 8 deg., normal 68 6 deg.; mean temperature 75 9 deg., normal 76.5 deg.; highest daily 91 3 deg on 27th, lowest daily 64.8 deg. on 26th.

Rainfall.—330 points on 13 days, average 628 points on 13 days.

Sunshine.—211.6 hours, highest since 1938 (249.1).

The rainfall position is summarised below—

Divisions.	Normal Mean.	Mean February, 1948.	Departure from Normal.
	Points.	Points.	Per. Cent.
Peninsula North ..	1308	1549	18 above
Peninsula South ..	896	415	54 below
Lower Carpentaria	617	249	60 ,,
Upper Carpentaria	556	141	75 ,,
North Coast, Barron	1288	896	30 ,,
North Coast, Herbert	1477	876	41 ,,
Central Coast, East	792	601	24 ,,
Central Coast, West	475	468	1 ,,
Central Highlands ..	351	138	61 ,,
Central Lowlands ..	310	109	65 ,,
Upper Western ..	304	103	66 ,,
Lower Western ..	195	196	1 above
South Coast, Port Curtis ..	576	463	20 below
South Coast, Moreton	658	390	41 ,,
Darling Downs, East	304	227	26 ,,
Darling Downs, West	233	119	49 ,,
Maranoa	282	186	34 ,,
Warrego	209	294	41 above
Far South-West ..	165	433	162 above

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

APRIL.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.57	5.47	Cairns	20	38	Longreach	31	39
6	6.00	5.41	Charleville.. ..	26	28	Quilpie	36	34
11	6.02	5.36	Cloncurry	44	56	Rockhampton ..	6	14
16	6.05	5.30	Cunnamulla ..	30	28	Roma	16	18
21	6.08	5.26	Dirranbandi ..	20	18	Townsville.. ..	18	33
26	6.10	5.21	Emerald	15	23	Winton	35	45
30	6.12	5.18	Hughenden ..	29	41	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	p.m.	p.m.
1	11.05	12.47
2	11.59	1.36
3	..	2.21
	a.m.	
4	12.55	3.00
5	1.50	3.34
6	2.45	4.06
7	3.39	4.36
8	4.32	5.05
9	5.26	5.34
10	6.21	6.04
11	7.18	6.37
12	8.19	7.15
13	9.21	7.58
14	10.25	8.49
15	11.28	9.47
	p.m.	
16	12.28	10.50
17	1.22	11.58
18	2.10	..
		a.m.
19	2.53	1.06
20	3.31	2.13
21	4.06	3.18
22	4.40	4.22
23	5.15	5.26
24	5.51	6.30
25	6.31	7.34
26	7.14	8.37
27	8.02	9.38
28	8.54	10.36
29	9.49	11.29
		p.m.
30	10.45	12.16

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS)

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	30	9	46	24	21	0	53	26
6	25	14	41	30	16	5	47	34
11	14	25	30	41	5	16	34	48
16	9	30	25	44	0	20	26	53
21	18	22	34	38	9	13	38	43
26	29	11	44	26	19	1	52	29
30	29	10	45	24	20	0	52	27

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	55	3	68	32	51	18	45	4
3	54	5	67	34	51	20	44	6
5	47	13	63	39	47	24	39	13
7	38	23	56	45	41	30	32	20
9	28	32	50	53	34	38	24	28
11	18	43	42	59	27	45	16	36
13	8	51	36	64	21	50	8	43
15	3	55	34	67	18	52	4	45
17	6	50	35	63	20	49	6	42
19	15	46	40	61	25	47	14	38
21	27	35	48	55	33	40	22	30
23	38	23	56	45	41	30	32	20
25	48	11	63	38	48	23	40	11
27	55	4	68	33	51	19	45	5
29	55	3	68	32	51	18	45	4
30	53	4	67	33	50	19	44	5

Phases of the Moon.—Last Quarter, 1st April, 8.25 p.m.; New Moon, 9th April, 11.16 p.m.; First Quarter, 17th April, 5.42 a.m.; Full Moon, 23rd April, 11.28 p.m.

At the middle of the month the Sun will rise and set 12 degrees north of true east and true west respectively, and on the 8th and 22nd the Moon will rise and set approximately at true east and true west.

Eclipse of the Moon.—A partial eclipse of the Moon will occur on 23rd April, but only a very small portion of the moon's disc will pass through the earth's shadow. The eclipse will begin at 11.20 p.m. and end at midnight.

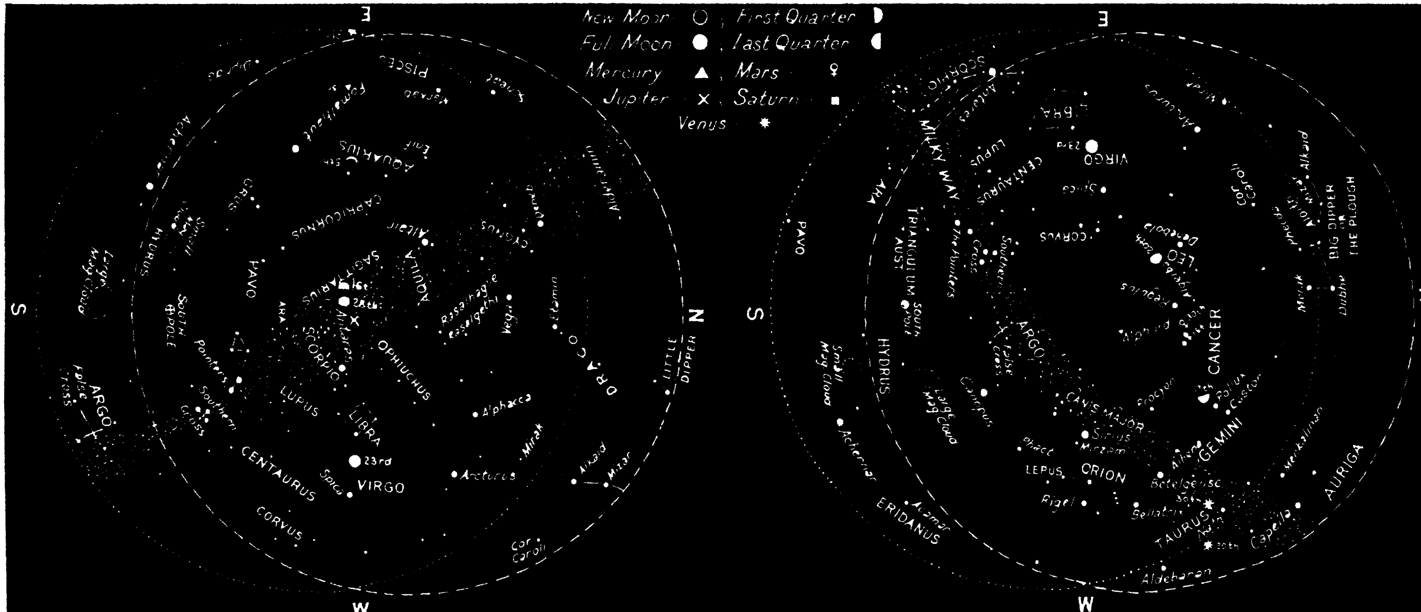
Mercury.—Will be a morning object nearly all this month. On the 1st in the constellation of Pisces it will rise one hour 45 minutes before the Sun. On the 29th it will be in line with the Sun and at the close of the month, in the constellation of Aries, it will rise and set with the Sun.

Venus.—In the constellation of Taurus, will reach its greatest angle east of the Sun on the 15th, when it will set about 2½ hours after sunset.

Mars.—In the constellation of Leo will be close to Saturn at the beginning of April, but during the month it will move towards Regulus. It will rise during the afternoon daylight hours and will set near midnight.

Jupiter.—In the constellation of Sagittarius, on the 1st, will rise between 10 p.m. and 11.15 p.m. and on the 30th between 8.15 p.m. and 9.30 p.m.

Saturn.—Though fainter than Mars, will be conspicuous in the eastern evening sky. At the beginning of the month it will be west of and slightly south of Mars.



Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8 15 p.m. along the Northern Territory border. On the 15th April (for every degree of longitude we go west the time increases 4 minutes). The chart on the left is for 9 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th, and at the end of the month about 1 hour earlier than that time. The positions of the Moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

FEBRUARY RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.,	No. of years' records.	Feb., 1947.	Feb., 1948.
North Coast.	In.		In.	In.
Atherton	11·44	42	12·39	3·65
Cairns	16·30	61	14·99	9·64
Cardwell	17·00	71	52·38	15·41
Cooktown	13·71	67	12·27	13·15
Herberton	8·63	57	10·61	4·09
Ingham	17·12	51	32·52	7·94
Innisfail	23·07	62	32·94	14·18
Mossman	20·86	19	13·45	14·27
Townsville	11·33	72	28·95	4·11
Central Coast.				
Ayr	9·62	56	66·17	5·65
Bowen	8·96	72	37·28	9·44
Charters Towers ..	4·63	61	14 29	5·53
Mackay	12·41	72	31·15	10·51
Proserpine	13·85	40	43.97	17·74
St. Lawrence ..	7·67	72	13·55	3·31
Central Highlands.				
Clermont	4·27	47	5·17	1·08
Springsure	3·78	74	6·41	3·37
South Coast.				
Biggenden	4·18	44	9·46	6·57
Bundaberg	6·39	60	22·57	4·87
Brisbane Bureau ..	6·27	95	9·77	3·30
South Coast—contd.	In.		In.	In
Caboolture	7·82	67	15·44	5·98
Childers	6·42	48	21·33	3·25
Crohamhurst.. ..	12·48	50	27·30	6·48
Esk	5·24	56	6·43	1·81
Gatton College ..	3·52	44	4·87	1·96
Gayndah	4·20	72	8·22	3·80
Gympie	6·58	73	15·98	7·04
Kilkivan	4·91	62	11·61	6·08
Maryborough ..	6·65	72	13·96	4·77
Nambour	9·57	47	25·39	5·33
Nanango	3·93	61	5·82	1·39
Rockhampton ..	7·74	72	11·05	3·11
Woodford	8·05	55	17·64	4·42
Darling Downs.				
Dalby..	2·85	73	2·79	1·00
Emu Vale	2·59	47	1·80	8·98
Jimbour	2·75	64	2·35	1·04
Miles	2·72	58	3·06	2·43
Stanthorpe	3·18	70	3·65	3·72
Toowoomba	4·53	71	9·68	2·74
Warwick	3·10	78	2·45	·55
Maranoa.				
Roma	2·87	69	6·46	.85
St. George	2·39	62	5·49	2 87

CLIMATOLOGICAL DATA FOR FEBRUARY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	88	73	93	28	69	9	964	19
Herberton	..	81	64	89	6	58	6	409	17
Townsville	..	87	74	92	27	70	9, 10	411	17
Rockhampton	29·91	90	70	107	8	66	24	311	13
Brisbane	29·98	83	69	91	27	65	26	330	13
Darling Downs.									
Dalby	..	90	65	100	27	58	7, 16	100	5
Stanthorpe	..	81	60	93	27	49	16	372	9
Toowoomba	..	81	62	94	27	56	26	274	11
Mid-Interior.									
Georgetown	29·83	94	73	98	6, 13	66	9	352	9
Longreach	29·86	101	..	110	6	..	..	100	4
Mitchell	29·89	95	70	102	1, 5, 24	60	8	190	4
Western.									
Burketown	..	..	..	..	..	..	..	394	6
Boulia	29·76	105	79	110	5	68	9	21	1
Thargomindah	29·81	97	73	109	2	67	7	607	7

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

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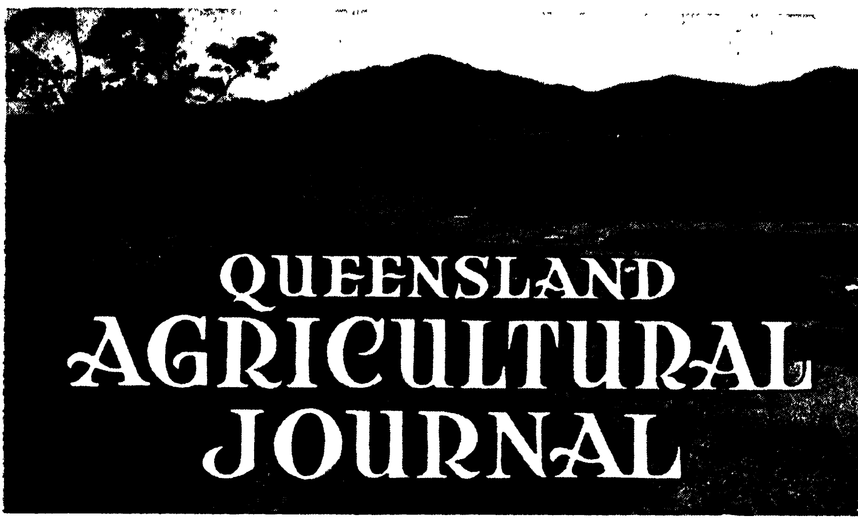
7

Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Art, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**



Volume 66 | 1 APRIL, 1948 | Part 4

Event and Comment.

Pig Carcase Competitions.

WITH the present emphasis on increased production of food for the United Kingdom, pig producers may well turn their thoughts to the export market, and, as pig raising fits in with diversified farming practice in Queensland, with our farm grains eminently suited for the production of a first-class product and climatic conditions equalled in few other countries, it would appear that an opportunity is being offered to the industry to firmly establish itself on the overseas market.

In the past pig production has been confused by, among other things, the variety of breeds and market gambling. However, producers should now make every effort to consolidate and concentrate on the production of a regular supply of a particular class of pig for an established market. Other countries have been faced with the necessity of satisfying a definite demand for a certain type of carcase, and have successfully tackled the problem of modifying their local types to fall in line with newer requirements. We are fortunate, however, in that the type required for our home markets is similar to that required for the export trade. Our methods, whether of production or processing, should advance to a higher level of efficiency if we are to be successful on the world's markets, and although the bacon type of pig is established throughout the country we should have selective breeding, better management and feeding, together with carcase grading. Payment for pigs on a quality basis will assist in building up the industry. Standards of quality should be the measuring stick for payment and development

of a sound commercial bacon pig. Standards have been the backbone of the highly successful production and marketing policies of Denmark and other countries, which have secured a position of importance in the British bacon market and are therefore no experiment.

Co-operation should be achieved among all branches of the industry, and this may be ensured by the adoption of standards which will properly relate the raw material to the finished product, of which type and quality are dictated by the consumer. It is apparent that there should be a very close relationship between the standard of the raw material or bacon pig and the standard of the cured product, and that the standard adapted for the raw material is the predominating factor in determining bacon quality. Such standards should be designed simply to set out in a concrete form the type of pig which will, when slaughtered, cured, dressed, and smoked, provide the desirable qualities and weight when later graded as bacon.

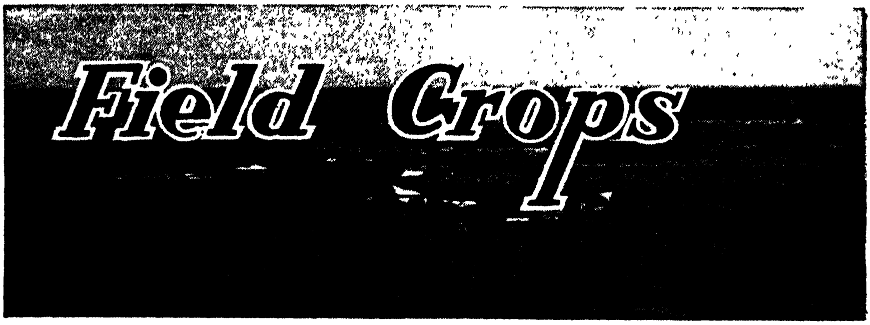
The more completely the producer is convinced of the importance of such a standard and its attainment through the whole process of production, the more likely he is to find the business of pig-raising profitable.

The grading of the pig is necessary for the protection of the producer of quality stock, whereby the efficient farmer is properly rewarded. The only logical standard is that determined by the requirements of the consuming public, in other words the commercial standard. Since the pure-bred pig is the fountainhead for commercial breeding, such pigs should be judged according to commercial standards, which are characterized by length of body, with minimum of fat and maximum of lean meat.

At the present time, probably no class of farm animal in Queensland better illustrates the desirability of type and standard than the pig. Both the breeder of pure-bred pigs and the producer of market pigs should, from now on, look from the same window, and in this regard the recent amalgamation of all pig producing interests under the Australian Pig Society is a move in the right direction and farmers are urged to give the Society their wholehearted support.

Efforts are being made to assist farmers generally to determine for themselves the correct type of pig to produce for present-day markets by fostering carcase competitions; in this respect show societies in many districts are including special classes in their pig section schedules, and it is hoped that these classes will be strongly backed by all producers. Evidence of growing interest in such competitions is shown by the record number of 60 entries received for the special baconer competition at the Beaudesert Show.

The Department of Agriculture and Stock is co-operating with the Australian Meat Board in the sponsoring of State pig-carcase competitions, particulars of which have been given wide publicity.



A New Type of Fertilizer Spreader.*

By G. CAMUGLIA.

THE fertilizer spreader to be described was designed specifically for the purpose of distributing sulphate of ammonia, but it may be used successfully with all common types of fertilizer.

In the design of this machine it was considered that the following features were essential:—

(*a*) The machine must be narrow enough to pass freely between the rows of cane, even when the crop was comparatively well developed;

(*b*) It must be light enough to make haulage easy;

(*c*) It must be strong enough to carry a reasonable quantity of fertilizer and to crush the hard lumps which occur in sulphate of ammonia;

(*d*) It must have as few moving parts as possible. The feeding device must be made of a material capable of resisting the chemical and physical action of the fertilizer and must be easy to clean.

Of these requirements the last was the most difficult to fulfil. A trial was made with a hardwood roller but this wore too quickly under the abrasive action of the material. Finally, a cast-iron roller was found suitable.

The implement is illustrated in Plate 61. It will be seen to consist of a simple carriage, 35 inches wide, on which rests a wooden hopper capable of holding one bag of fertilizer. At the bottom of this hopper is a cast-iron roller, four inches in diameter, in which are cut four helical grooves, each $\frac{5}{8}$ inch deep. The roller forms a rigid portion of the axle of the carriage. The wheels run free on the axle or may be locked to the axle by means of a manually operated pawl. When the pawl is engaged the roller rotates with the wheels.

---

* Paper presented at the Innisfail Conference, Q.S.S.C.T., May, 1947, and reprinted from the *Cane Growers' Quarterly Bulletin* (Bur. Sug. Expt. Stns., Dept. Agric. & Stk., Q.) for October, 1947.

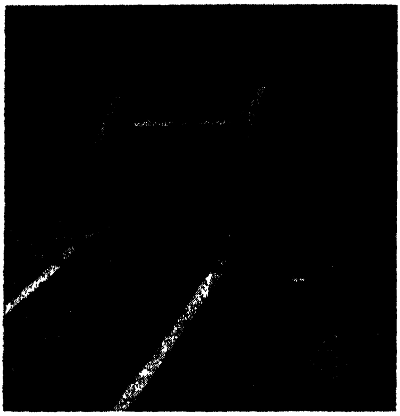



Plate 61.
TWO VIEWS OF FERTILIZER SPREADER.

Beneath the roller lies a flat cast-iron plate with a slot, ½ inch wide, parallel to the axis of the roller. A second plate sliding underneath this plate has its edge cut to a *V* shape, so that by advancing or withdrawing the lower plate, less or more of the slot is uncovered. The sliding plate may be locked in position by means of a bolt and wing nut. The adjustment provided enables the rate of application of fertilizer to be set within the range of one-half bag to four or more bags per acre. The stream of fertilizer emerging from the slot is divided and directed to two points of application by two sloping chutes, visible in the illustrations.

When drawn by a horse this spreader is capable of treating 14 to 16 acres per day—the operator riding on the carriage. The implement could be attached to a narrow tractor, in which case it could treat 20 acres per day. Provision is made for other implements to be attached to the rear of the spreader.

CHANGE OF ADDRESS.

Changes of address should be notified at least fourteen days before the date of issue with which the change is to take effect. The former address should be given as well as the full Christian names and surname of the subscriber.

Address all communications to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Mechanical Fertilizing.

By S. O. SKINNER.*

THE mechanisation of general cultivation work on the cane farm has progressed rapidly in recent years by the use of fast light tractors and their attachments, but it is somewhat surprising that similar progress has not occurred with the mechanisation of fertilizer distribution.

Most growers appreciate that hand spreading and vibrator methods are slow and laborious, as well as comparatively costly, and some have devised various attachments for their speedy tractors for particular fertilizing work, thereby making a satisfactory saving of labour. It is considered, however, that there is much scope for local or larger implement manufacturers to design an all-purpose distributor that could be used in conjunction with planting, cultivating and ratooning. In this connection, it is interesting to record the performance of an attachment purchased last year by Mr. A. G. E. Hansen, of the Qunaba Mill Area, from which most encouraging results have been obtained.

Plate 62.

SIDE VIEW OF FERTILIZER ATTACHMENT, SHOWING CHAIN DRIVE FROM REAR WHEEL, AND ARRANGEMENT OF HOSE OUTLETS ON CULTIVATOR TYNE.

The two photographs (Plates 62 and 63) show the distributor, which is one of the normal attachments for such tractors for vegetable cultivation. Two bins, each of approximately two kerosene tins in capacity, fit beside the fuel tank. Feeding from both containers is performed by internal cogs which are operated by a link chain and sprocket from off the rear wheel. Both bins have two chutes with flexible metal hoses which lead down to ground level. Normally, the hose outlets are attached behind tynes or similar cultivating tools.

* In the *Cane Growers' Quarterly Bulletin* (Bur. Sug. Expt. Stns., Dept. Agric. & Stk., Q.) for July, 1947.

The fertilizer is cut off at the end of drills by a dog clutch which automatically throws the gearing out with the pneumatic lifting of the tilling attachments. Rate of application can be adjusted from 60 to 600 lbs. per acre.

As indicated later, the grower has used the attachment in conjunction with practically all tractor operations. Its only limitation appears to be in the application of fertilizer to the drills during planting, where the furrows are opened by the planter itself. In this case, the extension of the flexible hoses to the planter at the back of the tractor does not allow sufficient fall for the fertilizer to flow after it leaves the bins. This limitation, however, is somewhat offset by the fact that cane planters are made usually with a special distributor for the purpose. However, the distributor on the cane planter cannot be employed independently

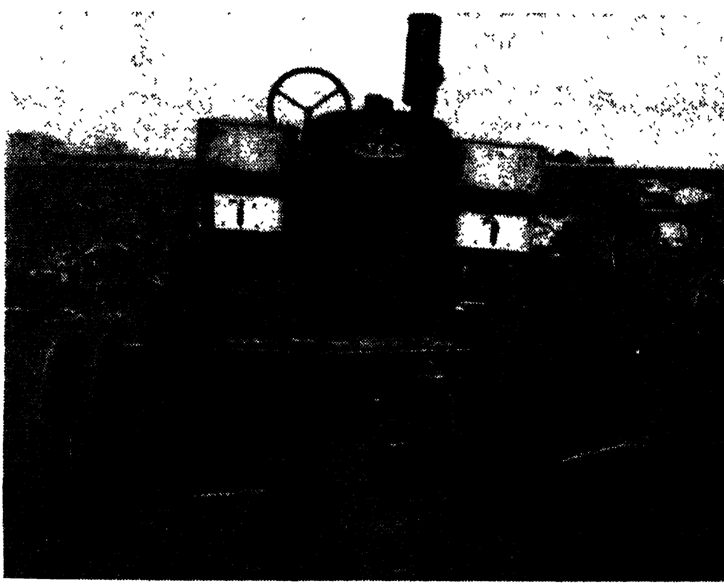


Plate 63.

FRONT VIEW OF FERTILIZER ATTACHMENT ON TRACTOR.

for later work, and the need for a further machine still exists. An improvement in the distributor illustrated would be a modification whereby the fertilizer attachment could be placed further back. This would eliminate the cost of the planter distributor, and also simplify its use with grubber ratooning. In the case of the latter with the present arrangement, and with the grubber either as a rear attachment or separate implement, the flexible hoses of the distributor have to be extended to small tynes as shown in the photograph Figs. 5 and 6. This prevents deeper placement of fertilizers, which would be obtained from behind the more powerful and deeper working grubber blades.

The distributor has not performed well with lumpy fertilizer, either sulphate of ammonia or mixtures, the trouble being due mainly to small lumps clogging together in one chute and causing a stoppage. The grower, however, has found it convenient and quick to tip the bag of fertilizer, as required, from the back of his farm trailer through a seven-eighths inch round hole sieve rested on a container. It is claimed

that this cannot be regarded as extra work since in any case the weight of present sized bags of fertilizer necessitates emptying into smaller containers to allow of filling most distributing receptacles. In one instance, during a slack day, the grower tipped, broke lumps and re-bagged some of his fertilizer into convenient smaller amounts in the storage shed. This prior breaking of hard lumped bags was found to be time saving, as it made filling of the distributor later a matter of minutes only.

The attachment has been used for all fertilizing operations on the farm, including:—

(1) For planting, in the case where the drills have already been opened, by applying the fertilizer to the open drills;

(2) For grubber ratooning, by taking the hose outlets to cultivating tynes;

(3) For top dressing, both with sulphate of ammonia and mixtures, in conjunction with cultivation;

(4) For rapid top dressing, without cultivation.

The adaptability of the fertilizer distributor is shown by the following instance—From accumulated sundry fertilizer stock, the grower desired to apply two different mixtures, as well as sulphate of ammonia and potash. By means of the two separate bins and sets of hoses, it was possible to apply two different mixtures at the one time to a block of cane and the potash and sulphate of ammonia in another operation to another block.

It was found also, when top dressing with sulphate of ammonia, that a better spreading was obtained than by hand. This was achieved by leaving the end 12 inches of the hoses loose, thus allowing them to swing freely with the movement of the tractor. In operation, this action gave distribution beside and around the stools, and under leaf level, thus eliminating any possibility of burning from the sulphate of ammonia falling on tender foliage. Since the fertilizer is normally applied with this attachment when carrying out other cultural operations, the acreage fertilized per day is of the same order as that covered by the tractor when used for planting, ratooning, cultivating or grubbing, less the slight loss of time in refilling the fertilizer bins.

The excellent rate at which the combined operations of fertilizing and cultivating were carried out, when using the scarifier attachments, was even improved in some instances. For example, where thorough cultivation was not essential, tynes were spaced wider than normal and every second row was straddled. By using the four hoses, the grower was able to fertilize both sides of each straddled row and one side of the adjoining two rows, and by repeating this operation on every alternate row, all drills were fertilized on both sides. Where top dressing only was required, similar straddling of alternate rows enabled a speedy cover of the field.

The cost of the distributor was approximately £29. It is not claimed that this particular attachment is the ideal one, or that there are not other distributors of equal merit, but its performance does demonstrate very clearly, the cheapness and rapidity with which large areas can be covered. It has shown, moreover, that labour costs can be reduced and that fertilizer distribution can be a less laborious task when combined, in the manner described above, with routine cultivation work.

Notes on the Common Reed.

By N. McD. SMITH.*

THIS plant, known as Reed Grass† and sometimes called Bluejoint Grass, Sword Grass, or Peashooter Grass, is widespread, and occurs along watercourses in the temperate to tropical zones of the world. From the banks of streams it has spread up the delivery ditches and secondary branches of drainage systems to cultivation in the Moreton district (Queensland.)

Its presence is always observed in a marshy environment, yet occasionally an isolated patch may be seen out of its normal surroundings. This can most likely be traced to filling being brought from a swamp or bank of a stream to build up a depression, in which case small portions of the underground runners have been included in the load. These runners are capable of producing shoots and constitute the major means of propagation as a careful check has not revealed any seedlings from the winter-blooming seed heads in the Moreton or Maryborough areas.

Some interesting facts about the Reed Grass relate to its botanical name and uses made of the stem. It seems that the genera name of Phragmites is derived from the Greek "phragma = a fence" and no doubt refers to the fence-like growth habit of the plant.

In England the reeds are gathered and utilised as a thatching, some reports stating it will last for eighty years. In more stoutly grown plants the stems were used as arrow shafts by the North American Indians, and also the early English. In England, before the introduction of quills, the stems were used in the making of pens.

As to its human food value, a reference states that the youngest shoots made an excellent ingredient for pickles.

Most of the cane-producing land of the Moreton district is low lying and it is here that Reed Grass has become a pest. In the most part the nuisance lies not in the choking out of cane, but in harvesting operations, when the swordlike edges of the leaves inflict wounds on the legs and arms when loading. If cut off at ground level the stump can also inflict painful cuts to the unprotected feet of the unwary. Where cane blocks are situated bordering swamps, and inadequate drainage is provided the Reed is a difficult proposition to control, and in some cases has gained mastery over the cane and other weeds.

Spread is not readily noticed as the shoots delay in development for some time before making maximum growth. If in wet conditions, and left undisturbed, progress is rapid, which necessitates regular clearing of drains every year.

Propagation by means of notched underground runners makes eradication most difficult, and as a piece containing one eye will shoot the problem in relation to spraying is intensified. From the headland ditches the pest has been observed to spread into cultivation from

* In the *Cane Growers' Quarterly Bulletin* (Bur. Sug. Expt. Stns., Dept. Agric. & Stock, Q.) for January, 1948.

† *Phragmites communis.*

portions of underground runners thrown out on the bank with sludge during cleaning. In one instance a ditch 6 feet deep was dug across a neck to shorten a creek and, at the bottom, cut ends of the Reed could be seen. Within two weeks each of these rhizomes had developed shoots of up to 6 inches long and gave indications of developing into a strong stand. The diggings from this ditch were covered with shoots within the two weeks, and patches where the soil had been carted to fill a hollow were showing indications of a future menace.

Plate 64.
THE FLOWER HEAD OF THE COMMON REED GRASS.

Chipping with a hand hoe or tearing and bruising with a scarifier will effect a temporary control until the cane can compete for sunlight. This is not an entirely satisfactory method as the operation promotes a stronger stool and breaking off of small subterranean pieces serves to spread the pest further along the row.

Spraying with the usual type of arsenical sprays has not been a success as, although the outer leaf sheath and leaves have been burned brown, the leaf spindle shoots again as the tight-fitting leaf sheath does not allow the material to penetrate down the stalk. A waxiness over all parts of the plant necessitates the use of a spreader for

complete coverage. Chipping and spraying have not had a marked weakening effect as new shoots appear between treatments, and as the operation must be regular and short-spaced this cannot be done as part of the normal farm routine.

Apart from the arsenicals used there has been a trial with a chlorate type of weed killer, but without success.

By far the best means of control is feeding off with horses as they are able to nip the shoots off close to the ground. The young growth is palatable and, if convenient to work in with the farm rotation, a grazing period of 18 months to 2 years will effect eradication. For areas along ditches the problem is very difficult as fencing off and grazing such irregular areas is not always practicable, and constant hoeing is necessary.

In the coming season some experimental work will be conducted on the possibilities of control, using the new hormone weedicides "Methoxone" and "2, 4-Di-weed" in combination with some of the well known chlorate type sprays such as "Atlacide."

A New Cane Lift.

By C. G. STORY.*

A RECOGNIZED characteristic of the Australian farmer is his ingenuity, and his ability to improve on existing farm machinery. To the ranks of those who have helped in this respect may be added the name of Mr. D. Treacy, Mackay, who has invented and provisionally patented a device whereby the slow and laborious task of truck-to-tramway cane-loading may be facilitated. His method will fulfil a long felt want at this stage of the harvesting programme.

One costly and time-consuming job in the crushing season is cane loading under present conditions, where the cane is lifted from lorries to tramway trucks or railway waggons. The methods at present in current use are (*a*) the use of chain block or hoist driven by an endless chain which is generally manually operated, (*b*) the use of lifting tackle driven by a motor cycle or light engine, (*c*) an engine-operated endless-chain hoist, (*d*) the method in common use with railway cane (the horse-operated lift which uses the principle of capstan and bar). The new device, and one which should prove very popular, is operated by driving the rear wheels of a truck on two sets of rollers. The gantry consists of two heavy posts and one transom, the same as that used for the endless chain method. Two parallel axles, each with a roller at each end, are placed beneath and at right angles to the tramline; these are supported in plummer blocks mounted on a steel framework. The wheels of the truck rest between each pair of rollers and when the wheels are driven in second gear they set the rollers in motion. To the front driven axle is attached a small cogwheel, which meshes with and drives a larger toothed wheel which operates the winding drum. To this drum

* In the *Cane Growers' Quarterly Bulletin* (Bur. Sug. Expt. Stns., Dept. Agric. & Stk., Q.) for January, 1948.

Plate 65.
Looking Across the Machine from the Brake Side.

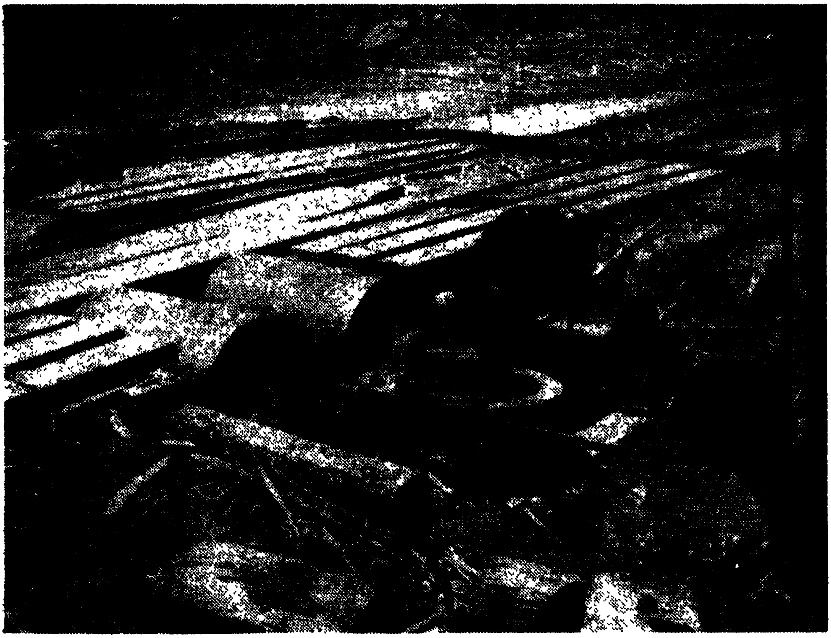


Plate 66.
The Winding Gear Showing Two Leading Blocks, Meshed Cog-wheels, Winding Drum and One Set of Rollers.

Plate 67.
WHEELS OF TRUCK IN POSITION TO DRIVE ROLLERS.

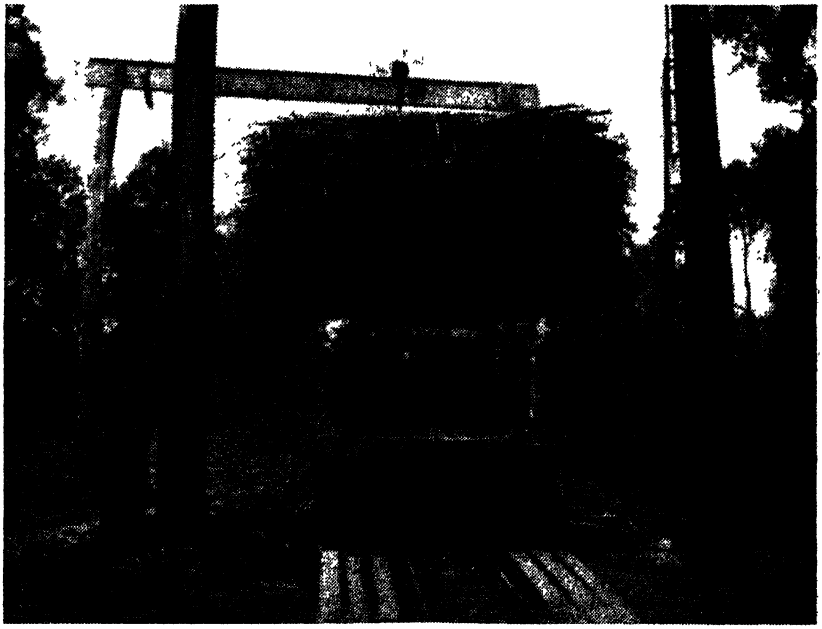


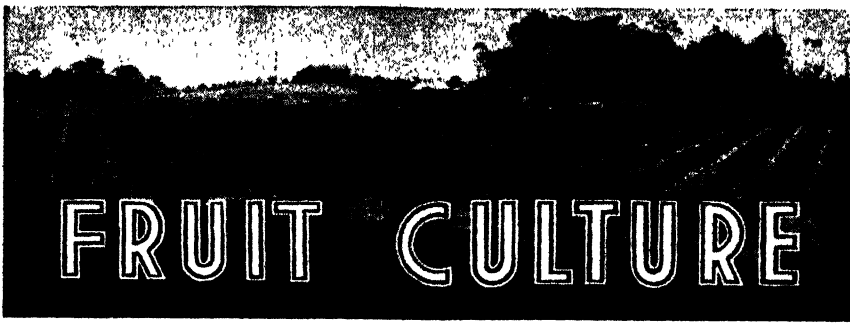
Plate 68.
APPLYING THE BRAKE AFTER THE LOAD IS RAISED FROM THE MOTOR TRUCK.

is attached a 2½-in. steel wire rope. To change the direction of the wire rope in order that the power may be favourably applied, two leading blocks, one horizontal and one vertical, are used near the base of one post. The rope passes through these two blocks then through two pulley wheels on the transom, one near the top of the post and the other in the middle of the transom, directly above the tramline where the load is to be lifted. The rope is then taken through a single block and the end made fast to a U-bolt on the transom. The wire slings around the load of cane are attached to the hook of the single block. As the large cogwheel is driven, the rope winds on its drum and the load is lifted by the wire rope, raising the single block. When the motor truck is removed, a sensitive brake holds the load in position and controls

Plate 69.

MILL TRUCK IN POSITION AND LOAD BEING LOWERED BY MEANS OF THE BRAKE MECHANISM.

the lowering of the load when the tram truck is placed under it. The load can be lifted the required height in ten seconds, while the lorry driver may comfortably unload the lorry, load the tram truck ready for despatch, and leave the loading area within five minutes. There is no skidding between the rubber tyres of the lorry and the metal of the rollers even when the lorry is empty. Wet tyres and drums do not affect the friction; rollers may be turned with one's foot and there is no wear and tear on the lorries. Mechanical trouble should not arise owing to the small number of moving parts. The outfit readily handles 3 to 4 tons and could accommodate heavier loads. The drivers of the trucks using this lift appreciate its value and the old manually-operated endless-chain lift hangs idle, mute testimony to the more progressive, efficient and expeditious method of loading.



Papaw Culture in Queensland.

G. W. J. AGNEW, Experimentalist, Horticulture Branch.

PAPAWS grow best in the wet tropics, where the high temperatures and rainfall provide conditions for continuous growth and development during most of the year.

A warm sheltered position on rich well-drained soil with abundant rain will produce high-yielding vigorous plants. Optimum conditions such as these are not encountered on the majority of Queensland's papaw plantations, as by far the greater number occur on the south-eastern coast, where winter temperatures during the four months from June to September, combined with cold winds and frequently occurring early summer droughts, are often sufficiently severe to affect adversely the development of the plant (Plate 70) or the maturation of the fruit. Occasional severe frosts, such as occurred in 1943, cause widespread damage among papaw plantations in low situations. By contrast, North Queensland plantations are not subject to the effects of frost or cold wind and the rainfall is much more favourable; however, cyclonic winds do occasionally take toll of plants in exposed positions on the tropical coast.

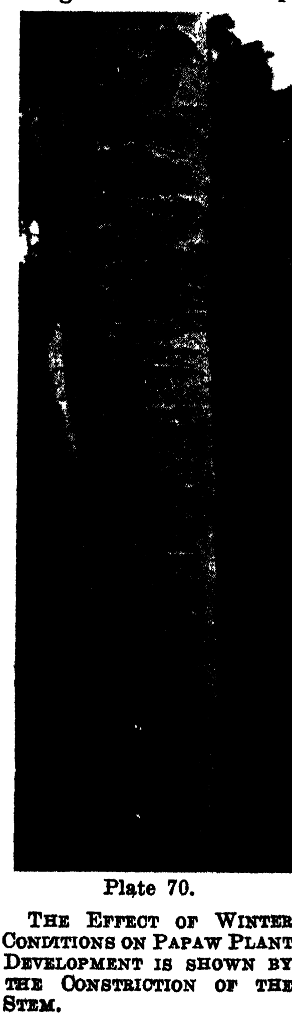


Plate 70.

THE EFFECT OF WINTER CONDITIONS ON PAPAW PLANT DEVELOPMENT IS SHOWN BY THE CONSTRICTION OF THE STEM.

Although some hazards do exist, many excellent plantations are to be found in various select positions along almost the whole length of the Queensland coast. The following districts are the chief sources of papaws in this State:—

South Coast, from Coolangatta to Cleveland;

Brisbane district, including Sunnybank, Brookfield, and Aspley;

Near North Coast, in the vicinity of Nambour, Gympie, the Mary Valley, and Gunalda;

Central Coast district, principally the Yarwun area, Rockhampton, and Mackay;

Far North Coast areas of Ayr, Townsville, Cardwell, and Cairns.

Owing to the long distances from the larger southern markets and the attendant transport difficulties associated with such a perishable product, together with the absence of canning facilities in the north, the far north coast, though eminently suited to papaw growing, has been largely limited to supplying small local markets.

Whilst the papaw is not a very difficult plant to grow, it will be found that attention to a number of details will materially enhance the prospects of establishing a commercial plantation and increasing the yield therefrom. The following sections deal with the important points to be observed.

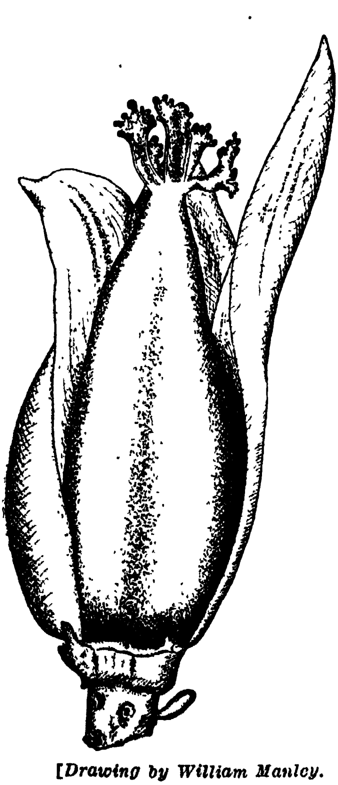
FLOWER AND PLANT TYPES.

A great deal of misunderstanding exists with regard to the occurrence and function of papaw flowers. This is attributable to the complexity of flower and plant types.

Flower Types.

Most species of flowering plants bear hermaphrodite flowers, with the reproductive organs of both sexes in combination, that is, both pistil and stamens occur within the same flower. There are, however, three primary flower types in the papaw, namely pistillate, staminate, and hermaphrodite or bisexual, and individual trees may bear one, two, or very rarely, all three of these. Generally, where more than one flower type occurs in a single plant, their co-existence is for brief periods only.

Pistillate flowers (Plate 71) are those which express the characters of femaleness only. They have five petals, free for their entire length, surrounding the female reproductive organ, the pistil, which is the flask-shaped structure protruding outwards from the centre of the flower. The upper portion of the pistil, the stigma, opens its five crinkled lobes at full bloom as receptive surfaces for pollen. The lower bulbous part of the pistil is the ovary, which is hollowed to form a cavity attached to the lining of which are the ovules, or seeds-to-be (Plate 72).



[*Drawing by William Manley.*

Plate 71.
PISTILLATE ("FEMALE") PAPAW FLOWER.

Plate 72.

CROSS SECTION OF THE OVARY OF A PISTILLATE ("FEMALE") PAPAW FLOWER SHOWING OVULES.

Flowers in which maleness only is expressed are staminate (Plate 73). The comparatively small petals of these flowers are fused together for slightly over half their length, forming a slender tube, which bears the stamens or male reproductive organs. There are ten stamens, each of which has a yellow lobed anther at its apex. The anthers produce pollen which is liberated in the late bud stage, just prior to the opening of the flower. Staminate flowers cannot produce fruit, since the pistil, which takes the form of a fine thread with a bulb at the base, is rudimentary and functionless.

Hermaphrodite flowers of the papaw are classified into three types, pentandria, intermediate, and elongata, according to the nature of their structural modifications. The importance of the various flower structures lies in the effect which they produce on fruit type. The pentandria type (Plate 74) is somewhat similar in general features to the pistillate type, except that it has five large stamens which arise near the base of the petals, and lie along grooves on the outer surface of the ovary. Pentandria flowers produce a typically squat fruit with deep grooves and well-defined petal scars at the base of the fruit. The intermediate type (Plate 75) comprises an indefinite group of freakish and distorted flowers, exhibiting various degrees of sexual development; malformed stamens and pistil are present in many grotesque associations. Fruits produced by intermediate flowers are extremely irregular in structure, and usually are of no commercial value.

The elongata (Plate 76) is the commonest hermaphrodite flower type. It has an elongate pistil partly enveloped by the petals which are united for portion of their length, thus forming a collar around the ovary.

There are ten stamens attached to the throat of the petal tube. Elongata flowers give rise to long fruits resembling in this respect a cucumber, or they may be pear-shaped. The seed cavity is comparatively small and often takes the form of a number of deep fissures, from which seeds are difficult to extract.

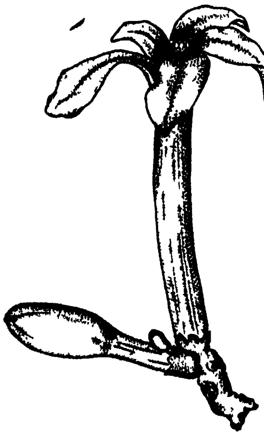


Plate 73.
STAMINATE ("MALE") PAPAW FLOWER.

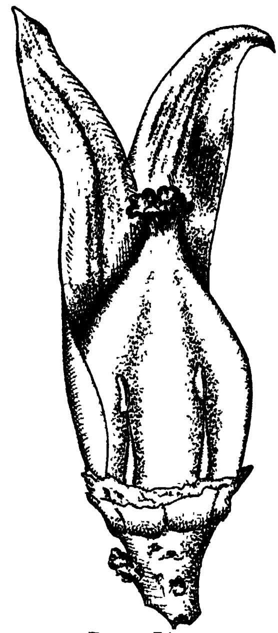


Plate 74.
PENTANDRIA TYPE OF HERMAPHRODITE ("BISEXUAL") PAPAW FLOWER.

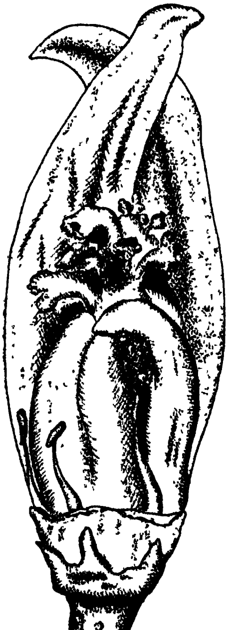


Plate 75.
INTERMEDIATE TYPE OF HERMAPHRODITE ("BISEXUAL") PAPAW FLOWER.

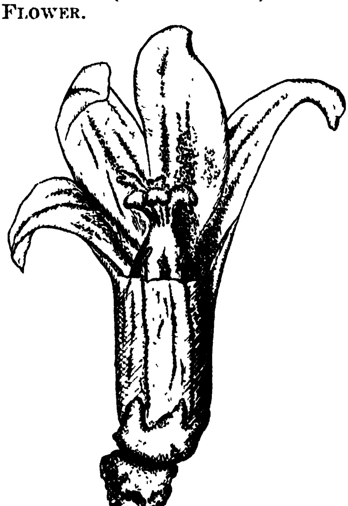


Plate 76.
ELONGATA TYPE OF HERMAPHRODITE ("BISEXUAL") PAPAW FLOWER.

[*Drawings by William Manley.*

Dioecious Papaw Plants.

Plants normally bearing either pistillate or staminate flowers only are collectively referred to as dioecious. Colloquially, trees bearing pistillate flowers are termed "females," whilst those which normally bear staminate flowers only are referred to as "males."

Plate 77.

"FEMALE" PAPAW TREE IN BEARING, SHOWING FRUIT PRODUCED BY PISTILLATE ("FEMALE") FLOWERS.

The flowers of female trees are produced on single or but simply-branched stalks varying from one to several inches in length, according to the characteristics of the strain. A principal flower is borne at the apex of the flower stalk, and smaller subsidiary flowers appear on the flower stalk further back towards the leaf axil. The size and number of subsidiary flowers vary considerably on the one tree during the flowering season as well as between trees of dissimilar strain.

Fruits produced by the pistillate flowers of female trees are usually rounded or oval in general outline (Plate 77), whilst common irregularities occur in the form of beaked fruits or fruits which taper away at the stalk end.

Plate 78.

PAPAW FRUIT TYPES PRODUCED BY HERMAPHRODITE ("BISEXUAL") FLOWERS ON "MALE" TREES.

The staminate flowers of male trees are produced in large numbers on profusely branched stalks, which attain a length of from three to five feet. Some male trees bear a number of reduced hemaphrodite flowers at the terminals of these stalks, particularly during the cool spring and autumn months. The pistils of these flowers become sufficiently developed to enable them to produce fruit (Plate 78) and large crops may be produced in this way, though the fruits are extremely variable in quality and are often of inferior type.

Hermaphrodite Papaw Plants.

All three hermaphrodite flower types are produced on flower stalks in a similar fashion to that of pistillate flowers on female trees. In the case of hermaphrodite flowers, however, the subsidiary flowers are in many instances functional staminate ones or abnormal hermaphrodites.

Plate 79.
Hermaphrodite ("Bisexual") Papaw Tree in which the Elongata Flower Type Predominated.

Plate 80.
Hermaphrodite ("Bisexual") Papaw Tree in which the Pentandria Flower Type Predominated.

In some cases, and particularly during the cool months, staminate flowers may be almost exclusively produced, and the trees then become virtually functional males for a limited period.

The three types frequently occur in the same tree, generally with pentandria (Plate 74) and elongata (Plate 76) predominating from time to time during the flowering season. In other trees again, one of the three types, commonly elongata, predominates throughout the life of the plant (Plates 79 and 80).

In Queensland, trees which bear practically all elongata flowers and which characteristically produce long, narrow fruit are popularly called "Long Toms." At one time this term may have signified one distinct strain, but at present it is applied indiscriminately to any long-fruited strain, and the use of the term Long Tom as representing a horticultural variety is now misleading.

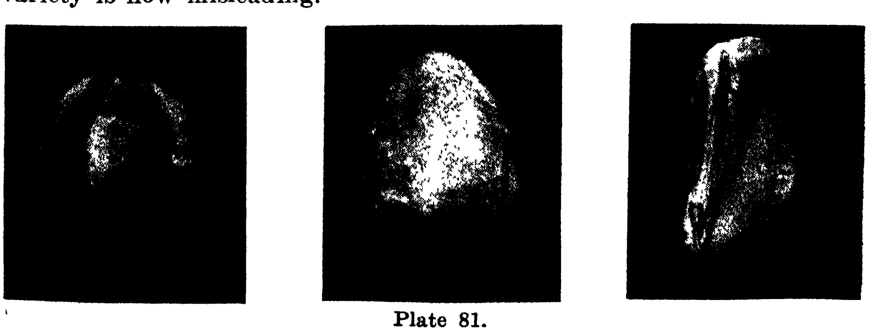


Plate 81.
Papaw Fruit Types Produced by Pentandria, Intermediate, and Elongata Hermaphrodite ("Bi-sexual") Flowers.

Fruit produced by pentandria, intermediate, and elongata hermaphrodite flowers are illustrated in Plate 81.

FRUIT AND SEED SETTING.

Normally, effective fruit development depends upon successful fertilization of the ovules (Plate 72), resulting in fully-formed and well-seeded fruits (Plate 82). In the central and south coastal districts, however, it is common to find trees bearing a number of undersized, seedless, and near-seedless fruits, particularly on female trees. These fruits may drop off in the early stages of development or they may be carried to maturity. All degrees of fruit size are encountered, from

Plate 82.

PAPAW TREE BEARING CROP OF EVENLY-DEVELOPED FRUIT, INDICATING FAVOURABLE NATURAL POLLINATION.

Plate 83.

PAPAW TREE CARRYING LIGHT CROP OF UNEVENLY-DEVELOPED FRUITS, INDICATING DEFECTIVE POLLINATION.

those almost fully developed to those about the size of a hen's egg (Plate 83). The weight and size of the fruit are roughly proportional to the number of seeds set (Plate 84), varying with the individuality of the tree, and with seasonal conditions at the time of flowering.

From their experience in the Madras Presidency of India, Cheema and Dani (1930) concluded that seedlessness in the papaw is due to lack of pollination. Recent investigations in Queensland have confirmed this conclusion, except that there are cases where seedlessness is a heritable characteristic. In describing the occurrence of seedless papaws in the Union of South Africa, Hofmeyr (1938) states that climate and deficiency of available pollen are probably the determining factors.

At times when pollen has been abundantly produced by male trees which have comprised as much as 10 per cent. of the tree population, examinations have shown that only a small proportion of the fruit

Plate 84.

PAPAW FRUIT SHOWING THE REDUCTION IN SIZE AND THE VARIATION IN SHAPE RESULTING FROM DEFECTIVE POLLINATION.

developed with a full complement of seed, as the result of natural field pollination, whereas flowers hand pollinated at the same time produced well-seeded fruits.

At certain times of the year, flowers which have been covered to prevent pollination have produced small seedless fruits parthenocarpically, that is, without the stimulus of pollination and fertilization. When defective pollination thus occurs, trees which bear a large number of subsidiary flowers often produce a large crop of small seedless and near-seedless, misshapen and crowded fruits.

Observations in southern Queensland during 1939, 1940 and 1941 showed that, with occasional exceptions, staminate flowers of male trees produced large quantities of pollen throughout the flowering season, which extends from October to July. There were, however, brief periods when pollen was not produced, though there was an abundance of

flowers. Two such periods were observed during the 1940-41 flowering season. These definite non-functional periods were of two to three weeks' duration, and during them pollen was absent from the mature anthers of staminate flowers; the presence of pre-pollen forms, or tetrads, in mature anthers confirmed the fact that pollen abortion had taken place.

Defective pollination is considered to be one of the chief cultural problems of dioecious papaws in the central and south coastal areas of Queensland, and it is therefore at present a subject of investigation. It is responsible for a considerable falling-off in yields, because of a reduction in the size and number of fruits (Plate 85), for irregularity in

Plate 85.
EIGHTEEN-MONTHS-OLD TREES, SHOWING POOR SETTING OF FRUIT.

fruit shapes within the one tree and, in certain instances, for permitting prolific subsidiary fruit development, resulting in a crowded undersized crop. At the present time hand pollination appears to be the only suitable corrective available, but the limit of its practical application is exceeded in plantations of tall trees, where difficulties are encountered in handling flowers to be pollinated.

Occasionally trees are found which bear almost an entire crop of fully-developed fruits, which are seedless or which have only one or two seeds in some of the fruits. The ovules in these instances are shrivelled and shrunken even in the bud stage of the flower, which suggests embryo abortion. There is evidence to show that this condition of seedlessness is a heritable character. At Nambour, seedlessness has reappeared in the progeny of a plant selected for this character.

PROPAGATION.

Seed Supply.

Until certified seed of proved varieties is available for general distribution, the papaw grower must rely for planting material on seed from fruit of recognized high-yielding trees, which produce good quality fruit (Plate 77).

Seed Treatment.

Seed freshly taken from the fruit should be cleared of the pulpy placental threads which generally adhere to them. The small membranous sacs of fluid surrounding the seeds may be broken by rubbing on a rough hessian bag over a board and the seeds then freed of these by washing in water. They should then be placed in the shade, in shallow dishes, cardboard boxes, or trays, to dry.

If it is intended to store the seed for a long period, it should be dusted with a fungicidal dust suitable for seed treatment and then stored away from the light in air-tight containers.

Time of Planting.

Successful germination may be obtained with papaw seeds at any time during the summer, from September to March.

Unless storm rains are experienced or irrigation is available, the early summer is a hazardous period in which to plant out young papaws, owing to hot drying winds and the danger from hailstorms, which can seriously damage such young tender plants. If seeds are planted in late spring (October) they germinate in about ten days and the plants make rapid progress and commence flowering before winter retards further growth.

More commonly, however, seeds are planted during midsummer (December) and young seedlings are then ready to transplant during late February or early March, when monsoonal rains usually provide wet and cloudy conditions suitable for the establishment of young trees in the field. These plants usually attain a height of about 2 feet before growth is virtually stopped by winter conditions, and flowering occurs about November. In this way March-planted trees generally bear their first crop closer to the ground than do trees planted early in the summer, which have a longer growing period during which the trunk may elongate appreciably.

Raising Seedlings.

There are a number of methods which may be used successfully in raising young papaw plants.

Seeds may be planted out directly in the field in their permanent positions. This method is generally adopted when plantings are made hurriedly, and also when planting in conjunction with crops such as pineapples, when the seeds are so placed that the leaves of the pineapples or other crop plant give protection and shade to the young seedlings. Planting out seed in an open field demands that constant care and attention be given, as otherwise many losses occur through the effects of insect enemies, disease, and unsuitable weather. It is also necessary to have a fairly large supply of seed, as generally about a dozen seeds or more are planted to each tree position, and thinning operations carried out later if necessary. The advantages claimed for this method are that the procedure is simple; it eliminates losses due to transplanting; and deeper rooting is obtained.

Another method is to plant seed in prepared seed-beds and dig out seedlings for transplanting when they are about 6 inches high. A large seed-bed space is required for this practice, as plants cannot be spaced closer than about 4 inches apart without growing spindly. Roots are generally disturbed when transplanting is done and unless the lower leaves are pinched off the plants will probably wilt. A worth-while practice, which reduces losses in transplanting from a seed-bed, is the wrapping of stems with a roll of firm paper from old books. This prevents scorching of the stems and keeps plants upright. It is always preferable to transplant on wet, cloudy days.

Plate 86.
YOUNG PAPAW TREES IN ROCKY COUNTRY.

A third, and probably the most certain method of obtaining a good strike with young trees is that of planting in containers. Either the seed is planted directly in the containers, or seeds are first sown in shallow seed boxes holding 4 to 6 inches of soil, and when the plants are about 2 inches high they are transferred to containers such as fruit-preserving cans, sheet-metal tubes, or earthenware pots. Containers made from pineapple paper mulch have been used successfully for this purpose. When seedlings are from 6 to 8 inches high they are transplanted with the soil intact. Planting can be carried out successfully during dry weather provided plants are watered in, so that wilting does not occur. Two or three plants may be left in each container and later separated out at planting.

When transplanting, it is necessary to place plants at the same depth in the soil in their new positions as when they were in the seed-bed, otherwise the stems may become diseased. The importance of placing plants at the correct depth is often overlooked, with consequent failure.

PLANTING.

Tree Positions for Dioecious Papaws.

As there is no certain method of distinguishing "male" from "female" trees before flower buds appear, it is necessary to plant out at least three or four seedlings to each ultimate tree position. Normally, approximately 50 per cent. "males" and 50 per cent. "females" should result from a "male" and "female" cross, and the multiple planting allows for culling of any unwanted "male" trees. Thinning should be done so as to leave one "male" as a pollinator for every ten "females." In each tree position, only one "female" tree should be allowed to grow past the first flowering period, otherwise the plants become spindly.

If leaves are trimmed and roots carefully preserved, culled "female" trees can be dug out and replanted to other positions in wet summer weather. These trees will be set back somewhat, but if in healthy growing condition they soon recover.

Tree Positions for Hermaphrodite Papaws.

It has been demonstrated, both in Queensland and overseas, that if hermaphrodite papaws are self-fertilized two-thirds of the progeny will be hermaphrodite and the remainder "females." If "females" are crossed with hermaphrodites, half the progeny will be hermaphrodites and the other half "females." In practice, this means the elimination of "male" trees in a planting where crosses of these types have been used, and all trees arising from the seed from these matings will be fruit-bearing; therefore, only one tree need be planted to each tree position. Good yields have been obtained in Queensland plantations of the hermaphrodite-female crosses.

If hermaphrodites only are required in the planting, then by planting three or four plants to each tree position the "females" can be culled out as in the case of superfluous "males."

Determining Sex of Papaw Plants in the Field.

The sex of young papaw trees may be determined when the young flower buds have appeared in the upper leaf axils near the growing point, and when the buds have grown to about ¼ inch in length. If the young bud is a branched structure, with a bud at the end of each branch, the sex is "male." If a single bud appears, and on unfolding the immature petals a bulb-like structure is exposed, the sex is "female." If a single bud appears, and on unfolding the petals a number of small pollen sacs are visible, the sex is "hermaphrodite."

Spacing.

Spacing distances for papaw plants in the field range from 6 feet by 6 feet to 12 feet by 12 feet according to the particular conditions. It has been observed that trees on virgin rain-forest land grow very tall in the first year if planted too closely together, and thus often much of the first crop must be harvested by ladder. A spacing of 8 feet by 12 feet or 10 feet by 10 feet has been found suitable in these circumstances. Some growers plant 6 feet by 6 feet; but generally this is considered to be too close, for though good crops have been produced with this spacing, the trees commonly become spindly. A close planting tends to give greater protection to fruits, greatly lessening the effect of

adverse winds and sun scald. As the papaw is primarily a surface rooting plant, the soil surface should be kept shaded during the hot dry summer months, and close planting tends to achieve this end.

It was demonstrated in Florida that a 6 feet by 6 feet spacing actually increased the weight of fruit produced by 62 per cent. on the average over other plantings spaced 6 feet by 9 feet and 6 feet by 12 feet. This large increase in yield is explained by the extra number of trees planted per acre. Trees with the wider spacing of 6 feet by 12 feet actually produced more fruits per tree, the average being 23 as against 19.3.

An 8 feet by 8 feet spacing is considered to be generally satisfactory for average plantation conditions, except for the convenience of cultural operations or the peculiar requirements of certain varieties; wider spacings such as 9 feet by 9 feet, 10 feet by 10 feet, or 8 feet by 12 feet may be found to give greatest efficiency in particular circumstances.

TABLE OF SPACING DISTANCES FOR SQUARE PLANTING.

Distance Apart.	Number of Trees per Acre.
6 ft. x. 6 ft.	1,210
7 ft. x 7 ft.	889
8 ft. x 8 ft.	680
9 ft. x 9 ft.	537
10 ft. x 10 ft.	435
12 ft. x 12 ft.	302

GROWTH AND DEVELOPMENT.

During 1940 and 1941 an experimental area of 500 trees of the Florida Betty variety was established at Nambour, on the Near North Coast, on land which had previously grown pineapples. The following observations were made on 32 trees representative of the planting.

Flower Production and Fruit Set.

During the principal flowering period from November to late January the average number of flowers produced per tree was 46, or slightly more than an average of four flowers per week. The percentage fruit set varied from 47 per cent. to 73 per cent. for individual trees, with an average setting of 63 per cent. for all flowers produced. A much lower percentage fruit setting could be expected from the late summer flowering, as the protracted wet weather often experienced in February, March, or April prevents natural pollination. There were slightly more than 10 per cent. "male" trees in this plantation to act as pollinators.

Yields.

The following table gives the percentage of fruits in grades according to weight, the largest fruits being mainly produced by December flowers:—

Fruit Weight.	Percentage.
Less than 1 lb.	4·3
From 1 to 2 lb.	12·8
From 2 to 2½ lb.	30·8
From 3½ to 5 lb.	29·3
5 lb. and over	22.8

Average tree production for the first crop from the main flowering period (November to January) was 29 fruits per tree, with average weight of 2 lb. 14 oz. per fruit, which gives a crop yield of 83·4 lb. per tree. This is equivalent to slightly more than 3 bushels.

Fruit Development.

The time taken for complete fruit development from flowering to maturity of the fruit varied from 175 to 275 days. Fruit from early summer flowers reached maturity in much less time than did those from late summer flowers.

Month of Flowering.	Fruit Development in Days.
November	175 to 185
December	175 to 240
January	230 to 260
February	255 to 275
March	230 to 260

Plate 87.
A BRANCHED PAPAW TREE.

The foregoing indicates that an early winter crop maturing in May and June was produced by November and December flowers, whereas the spring crop in August and September was produced by late summer flowers. The effect of winter in retarding maturation is evident by the additional time taken to reach maturity—in this instance from 50 to 70 days.

BRANCHING.

Branching (Plate 87) commonly occurs in papaws as a result of injury to the growing tip. Some strains, however, have a tendency to branch more than others and will do so to a considerable extent, even in the absence of an injury.

Where optimum conditions for vigorous growth are experienced, allowing young trees to carry branches has been successful; but most branched trees produce smaller fruit than single stemmed trees and, except under the most favourable growing conditions, the practice is not recommended.

Highly placed branches are often broken off from the main stem by wind or by the weight of fruit they are carrying, and branches which project at an angle from the main stem require propping or tying back to avoid this trouble.

CUTTING BACK.

Aged trees which are in a healthy condition can be rejuvenated by cutting the stem down at a point about 2 feet above ground where the stem is not hollow. This can also be done with young trees that have grown too tall for convenience of harvesting. After being so cut, the tree will shoot from a number of places on the stump, and two or three of the most vigorous shoots are then allowed to grow. This cutting operation should be done during the early spring so as to allow a sufficiently long growing period for the plant to recover. It is a good practice to cover the cut surface of the stem with a tin to prevent cracking and subsequent decay.

HARVESTING.

In southern Queensland, though small quantities of fruit may be ripening throughout most of the year, there are two important harvest periods—one during April, May, and June, and the other, which is really the main one, during September, October, and November. In northern Queensland harvesting is spread over a longer period.

For local markets fruit should be harvested in the firm-ripe stage when the first colour is showing, and should fully ripen in from four to five days. For export to Southern markets fruit should be picked at an earlier stage, allowing about eight days before fully ripening. The stage of maturity, as gauged by external colouring of the fruit, will vary according to seasonal conditions, the variety grown, and the requirements of the buyer, but generally the fruit should be harvested at an earlier stage in the summer than in the winter.

Great care must be exercised in harvesting papaws in the firm-ripe stage as they bruise easily. The fruit should be cut from the tree and not pulled, as pulling often results in damage to the basal end. Fruit stalks should be cut close to the tree stem, to prevent remaining fruits from rubbing on the stub. Finally, the stalk on the fruit should be trimmed before packing.

The milky latex which exudes from the broken rind of immature papaws causes considerable irritation to the skin of the operator handling them for any lengthy period and the wearing of rubber gloves and an apron is therefore recommended.

SOILS AND FERTILIZER REQUIREMENTS.

In Queensland, papaw plantations are placed either on virgin land recently cleared of rain-forest or hardwood forest, or on "old land," which has been under cultivation to pineapples, bananas, or other crops for several years. These soils vary considerably in type and include brown sandy soil, alluvial clay loam and red volcanic loam.

Many plantations are necessarily placed high up on hillsides to avoid frost, and are thus frequently associated with rocky and gravelly soils. A free draining soil is essential to healthy growth; waterlogging will result in stunted growth which is generally accompanied by disease.

Where natural soil fertility is high, excellent yields of high-quality fruit have been obtained without the use of fertilizers. More typically, however, plantation sites occur on soils of low or medium fertility, in which plant nutrient materials have been depleted by continuous cropping over a long term and by losses due to erosion and leaching. The papaw tree draws heavily on the water and plant food supply of the surrounding soil for at least eight months of the year during its active growing period, and to support and maintain this long period of activity liberal amounts of water and plant food must be available.

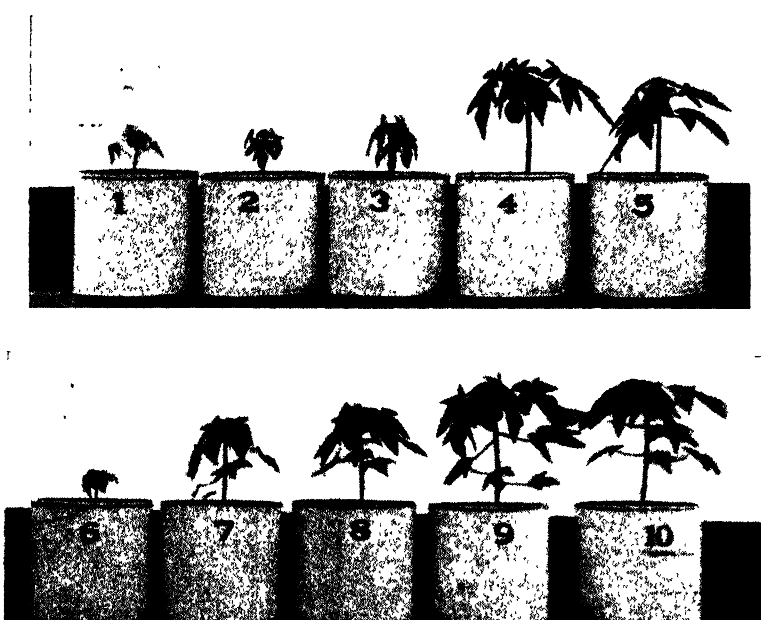


Plate 88.

Showing the Effect of Organic Manures (Pots 4, 5, 9, 10) Compared with Inorganic Fertilizers (Pots 2, 3, 7, 8) and no Fertilizer (Pots 1, 6). The Lower Series was Limed.

During 1940 and 1941 experiments were conducted at Nambour, on a brown sandy loam, typical of much of the soil on which this fruit is grown. All trees in the experiment received the same amount of nitrogen. There were no responses to phosphate or potash treatment, except in the case of phosphate after liming. Phosphates significantly increased the yield in the presence of lime and depressed the yield in the absence of lime. (Hydrated lime was applied at the rate of 4 tons per acre.) Soils under this test ranged in pH value from 4·5 to 5.

Experiments conducted at the Hawaiian Agricultural Experiment Station have shown that ample supplies of nitrogen and phosphate are necessary and that an increased quantity of potash is required after the flowering stage has been reached. The use of a 6 : 12 : 6 mixture, given at the rate of 2¼ lb. per tree per year, in four quarterly applications, has been found beneficial.

Comprehensive experiments conducted in Florida demonstrated that greatly increased yields were obtained from comparatively large annual applications of fertilizer. The recommendations for that State include the use of a 5 : 6 : 5 mixture for young trees, given at the rate of 3 to 4 oz. per month, and for mature trees up to 1½ lb. of a 4 : 8 : 8 mixture per month during the growing season.

In North Queensland, results of trials with potted seedlings, which were conducted with young seedling papaw plants up to 15 weeks after germination, indicated that favourable growth response was obtained

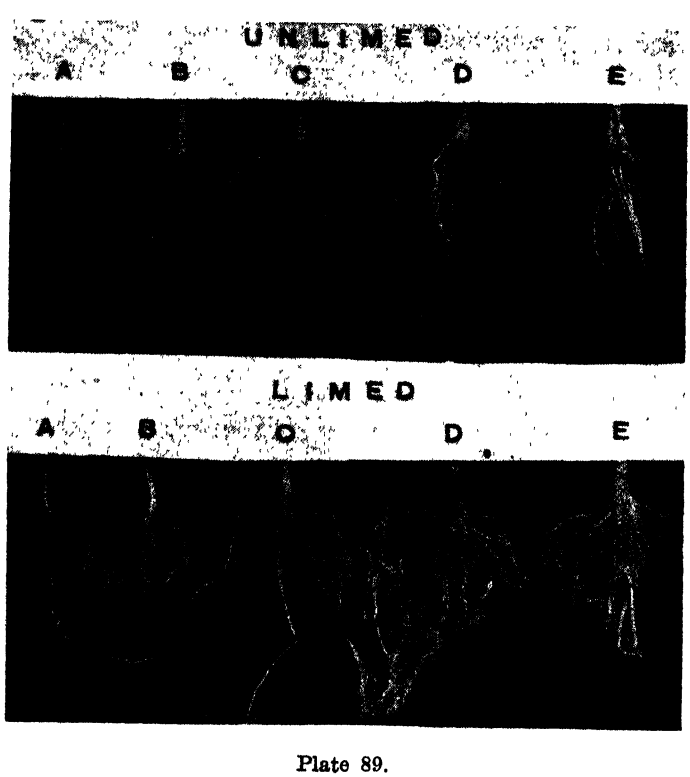


Plate 89.

SHOWING THE EFFECT OF LIMING ON ROOT DEVELOPMENT OF PAPAWS.

from the use of organic fertilizers, particularly dried blood. The growth increase for plants receiving organic fertilizers, as determined by stem height, was measurably greater than was the case where an equivalent amount of nitrogen was supplied as sulphate of ammonia. This is shown in Plate 88, where pots 4 and 5, in an unlimed series, and pots 9 and 10, in a limed series, received organic manures.

VALUE OF LIME.

Plate 89 illustrates the effect of liming on the root development of young papaw seedlings grown in pots. A more vigorous fibrous root system was developed in all plants receiving lime. There was no general significant increase in stem height due to lime in this experiment. In this pot trial plants receiving no lime showed chlorotic symptoms and dropped their lower leaves prematurely, leaving an "umbrella" top as seen in Plate 88 (Nos. 1 to 5 were unlimed and Nos. 6 to 10 were limed). This experiment was conducted at South Johnstone, North Queensland, on silty alluvial loam with pH of 4·7 to 5·7.

In a pot experiment with Nambour sandy loam more than 100 per cent. increase in height during the first 21 weeks was obtained by the application of hydrated lime at the rate of 4 tons per acre.

GENERAL FERTILIZER RECOMMENDATIONS FOR QUEENSLAND.

Plate 90.
A Young Papaw Tree in Crop, Gunalda District.

Although much information remains to be obtained by experiment under varied soil conditions in order to put forward recommendations which will suit each of the diverse soils on which papaws are grown, it is considered that the following measures will prove satisfactory in most instances.

An 8:12:6 mixture applied at the following rates per tree:—

(1) 4 oz. for trees up to 3 months old;

(2) 12 oz. for trees up to 6 months old;

(3) 2 to 3 lb. for trees 1 year old and upwards.

Fertilizer should be applied in three or four applications during the growing and blossoming period in September, November, and February, with a light application in April. On depleted soils a basal dressing at time of planting is to be recommended.

Hydrated lime as an initial application, broadcast at the rate of 3 to 4 tons per acre, or an equivalent amount of some other form of lime, should be beneficial, particularly on soils registering below 5·5 on the pH scale.

Lime, applied about three months in advance, combined with a legume cover crop before planting the trees, will assist in restoring fertility in many so-called "worn-out" coastal orchard lands, which it is intended to plant with papaws.

CULTIVATION.

The manner and method of cultivation of papaw plantations vary considerably with the type of plantation. Many of these are so steep and rocky that anything other than hand cultivation is precluded. The distance of plant spacing will also influence the method of cultivation employed. Owing to the shallow-rooting habit, it is impossible to do more than stir the first 3 or 4 inches without doing considerable injury to the roots. It is imperative, however, that weeds be suppressed, particularly during the dry spring and early summer months. Papaws respond well to mulching with dry grass hay, cowpea hay or other litter. The mulch cover, besides retarding surface evaporation, also helps to suppress weed growth and is a constant supply of decomposing organic matter, slowly building up the humus content of the soil.

Useful Water Data.

1 inch of rain equals 22,622½ gallons per acre, and about 14,000,000 gallons per square mile.

1 inch of rain equals about 100 tons of water per acre.

1 inch of rain equals about ½ gallon of water per square foot.

1 inch of rain in a year falling on a square mile would yield, if stored, about 38,000 gallons per day.

1 cubic foot of water equals 6·23 gallons and weighs nearly 62½ lb. or 1,000 oz.

32 cubic feet of water weigh 1 short ton (2,000 lb.).

36 cubic feet of water weigh 1 long ton (2,240 lb.).

1 gallon of water weighs 10 lb.

224 gallons of water weigh 1 long ton.

The British Imperial gallon equals very nearly 1⅕ United States gallons.

1 gallon equals 4·5449 litres.

A column of water 1 foot high exerts a pressure of 0·433 lb. per square inch or 62·352 lb. per square foot.

Water containing the following grains of salt per gallon contains the indicated number of pounds of salt per acre inch:—

1 grain per gallon equals 3·23 lb. salt per acre inch.
5 grains per gallon equals 16·15 lb. salt per acre inch.
10 grains per gallon equals 32·3 lb. salt per acre inch.
20 grains per gallon equals 64·6 lb. salt per acre inch.
30 grains per gallon equals 96·9 lb. salt per acre inch.
40 grains per gallon equals 129·2 lb. salt per acre inch.

N.J.K. in the *Cane Growers' Quarterly Bulletin* for January.

"Leg Itch" of Sheep in Queensland.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

LEG itch is a disease of sheep which is caused by a specific mite* known as the "leg mite." Similar mites occur extensively in other States of Australia and in New Guinea, America, and England. In England they are known as "harvest mites," and in South Australia they cause a condition of man known as "duck-shooters' itch."

For many years a condition known as "black soil itch" has affected humans in the Clermont, Emerald, and Springsure districts of Queensland, and this was considered by local residents to be associated with the presence of a tiny mite which appeared to be restricted in its distribution to the black soils of the central highlands.

When investigations were commenced in 1944 into a peculiar condition affecting the legs of sheep on properties near Clermont, attention was soon focused on the mite which had been known for so many years to attack man. Subsequent work incriminated these mites as being responsible for initiating the trouble in sheep.

The Leg Mite.

The life cycle of the leg mite has not been determined, but it is known that mites of this type go through various well-established stages in their development. The female adults live in the soil and are about one-twenty-fifth of an inch long. Their eggs hatch into a minute but very active larval form (Plate 91). It is this larval mite which parasitises warm-blooded animals, including man, sheep, horses, and kangaroos. After feeding from the body fluids for from three to five days the larval mites return to the soil and moult to become nymphs. After another moult the nymphs become sexually mature adults. It is not known what type of foodstuffs the nymphal and adult mites prefer, but apparently they do not parasitise the warm-blooded animals.

The larvae are particularly interesting because of their unique method of obtaining food from their hosts. Their attack does not cause any irritation for some hours. This period is apparently spent in selecting a suitable site and in boring through the hard layers of the outside skin. Following the initial piercing of the skin the mites develop a thick-walled feeding tube, with a narrow bore, which lengthens as the

* *Trombicula sarcina.*

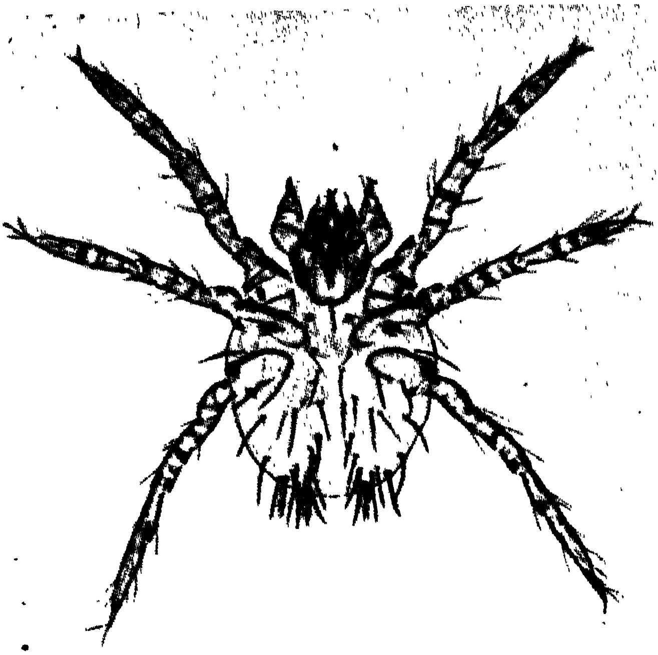


Plate 91.
A MUCH ENLARGED VIEW OF THE LEG MITE.

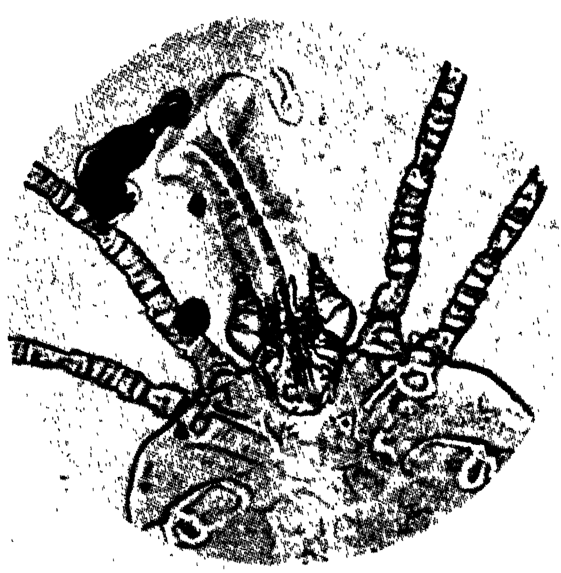


Plate 92.
SHOWING THE LEG MITE WITH THE FEEDING TUBE ATTACHED.

period of engorgement proceeds (Plate 92). The mechanism used in the development of this feeding tube is not clearly understood, but the irritation it causes can be intense, and after a mite has been feeding for some days the tube may be much longer than the mite itself.

After the mite has fed, it detaches itself from the feeding tube, which it leaves in its host, and wanders off till it reaches the earth, where it moults to form a nymph.

Seasonal Occurrence and Incidence.

All observations confirm the opinion that the mites are particularly active after the summer rains. The infestation of sheep which was noticed in the mid-summer of 1942 continued until April, 1943. Another outbreak appeared in December of that year and continued until May, 1944, when no new active cases were seen. By June, 1944, only old regressing lesions were found.

Observations made during the summer outbreak of 1943-44 suggested that the new cases occurred in waves. Search for mites in areas which appeared to be their most favoured habitats confirmed the occurrence of great numbers during the summer, particularly after rain, and a diminution in their numbers during early winter. In one well-known habitat which did not receive the August-September rain, larvae could not be found after prolonged search in mid-November, 1944.

Sheep depastured on affected areas appeared to develop leg itch irrespective of sex or age. The lesions became as advanced and were as numerous on ewes as on wethers, but no outbreaks in young lambs came under notice. This, however, may have been due to the fact that on many of the properties where the condition occurs the ewes lamb in autumn.

Inspection of flocks where infestation was occurring revealed that over 30 per cent. of animals showed lesions in some form or another. In one flock a detailed examination showed that 90 per cent. of the sheep had been affected within the last few months, and 10 per cent. showed acute lesions. A further 7 per cent. had been infested very recently and early lesions could be found.

Affected sheep usually take about six to eight weeks to recover completely, and as new infestations continue to appear in a flock during the mite season animals may be seen showing lesions in various stages of advancement and regression.

Symptoms and Lesions.

When sheep are first affected they stamp their feet repeatedly and bite their legs. This presumably results from the intense irritation caused by the attachment and feeding of the mites.

Inspection reveals the skin of the heels, coronet, and pastern, and sometimes of the shank, to be reddened and broken. At this stage engorging larvae can usually be found arranged in rosette-shaped clusters commonly about one-twenty-fifth of an inch in diameter. Should the period of engorgement of the mites be almost complete the cluster appears characteristically as a small yellow-golden centre of a small inflamed weal about one-eighth of an inch in diameter. The weal is slightly raised, and at the centre of the cluster of mites there is a small blanched glistening area of skin which sometimes exudes droplets of clear fluid.

Plate 93.
A CASE OF LEG MITE INFESTATION IN AN ADVANCED STAGE.

On completion of their engorgement in three to five days the mites depart from their host, leaving a small ulcerated area.

As a result of secondary infection of the ulcerated areas caused by the attachment of the mites, and of the broken skin which results from the sheep biting their legs, the skin over the whole of the shanks and fetlocks may become swollen and thickened. Under the scabs which form over the broken skin a greenish pus is commonly found. When this stage is reached the itchiness appears to have subsided, though affected shanks are warm to the touch and have an objectionable odour.

As the condition progresses the skin becomes markedly thickened and is thrown into folds—the affected shanks may become about twice their natural thickness. In advanced cases the lesions may be extensive (Plate 93). They have been seen covering the whole of the unwoolled portion of the leg; that is, from the coronet to the knee or hock. It appears to be rare for the infestation to involve parts covered with wool.

In the early stages of recovery the legs of severe cases are covered with wart-like overgrowths of the skin.

A section of the skin of advanced cases was seen to be of a greenish-yellow hue and markedly thickened. There were small channels containing a greenish, dry, crumbling pus, though there appeared to be no involvement of the underneath skin.

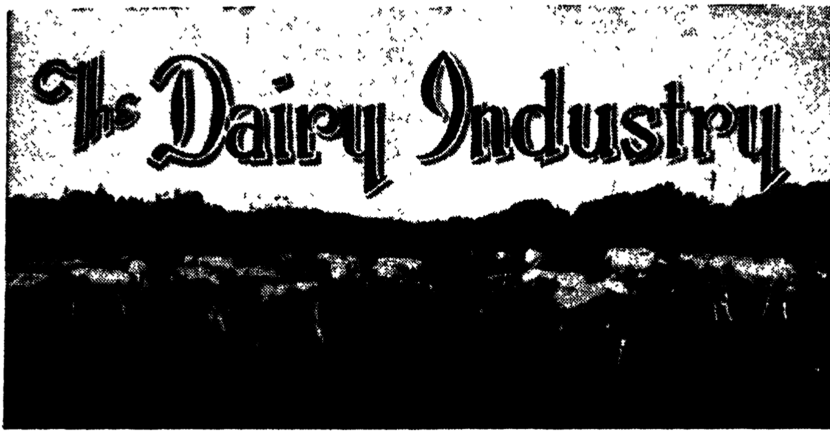
As the lesions regress the skin gradually returns to normal, but for several weeks, until the hair has grown again, the shanks present a typical "moth-eaten" appearance.

Control Measures.

Preliminary trials have been conducted with the more recently developed insecticides, including D.D.T. and di-butyl phthalate, but no definite results have been obtained. The value of dimethyl phthalate, which has similar properties to di-butyl phthalate, in protecting humans is, however, well known.

QUEENSLAND SHOW DATES, 1948.

Baralaba	June 4–5
Boonah Show	June 4–5
Bowen	June 30–July 1
Brisbane R.N.A.	August 7–14
Bundaberg	June 3–5
Cairns	July 20–22
Cooroy	August 28
Gatton	July 15–17
Gin Gin	June 7–8
Gladstone	June 10–12
Ingham	July 16–17
Innisfail	July 30–31
Laidley	June 25–26
Lawnton	July 30–31
Lowood	June 11–12, 14
Mackay	June 22–24
Malanda	September 3–4
Nambour	July 1–3
Proserpine	June 25–26
Rockhampton	June 16–19
Rosewood	July 9–10
Toogoolawah	June 18–19
Townsville	July 6–8



Dairying as a Business.

R. H. BARTLAM, Division of Dairying.

FARMING is a business and as in any other business careful planning and sound methods are essential to success. Haphazard methods on the farm will spell disaster as surely as they will in any other commercial enterprise. No farmer is in the business of dairying for his health alone, and while the successful farmer must have an inherent love of the soil and of animals, his primary reason for being on the land is to make money for himself and his family and possibly to build up a thriving concern for his children to carry on after him.

The main factors which influence success in dairy-farming are:—

(1) Security of tenure;

(2) The capital value of the property;

(3) Quality of dairy stock;

(4) Maintenance of a high standard of production.

Security of Tenure.

The outstanding factor which requires consideration in relation to a farming venture is security of tenure. The farmer must look well ahead and plan for the future. He cannot do this if his hold on the property is insecure. Consequently farming leases are unwise unless for a fairly long term and adequate safeguards are provided to ensure that the lessee receives recognition for improvements effected by him.

Capital Value of Property.

The folly of purchasing a property at too high a value cannot be over-emphasised. While good farms are never cheap, prices of land are frequently influenced by conditions which are only temporary, and this should be realised when a property is being valued. It is usually unwise to buy land when abnormally high prices are the rule. It should be remembered that the value of a property should bear a direct relationship to the amount of income which can be derived from it and in calculating this due allowance must be made-

for the possibility that prices may drop and the likelihood of bad seasons must always be kept in view. If a purchase is made at an exorbitant price, the consequent heavy payments for interest and redemption may well be a millstone around the neck of the farmer for the greater part of his life. Even if the price of a property is reasonable the prospective dairy farmer must consider his own ability to work it with the labour and machinery available. No matter how good a farm is, its value to the purchaser depends on the degree of productivity which he can obtain from it. It is unwise to buy a very large farm unless the purchaser is in a position to work the whole of it efficiently.

Quality of Dairy Stock.

Whether milk or cream is sold, stock should be selected to suit the country. The foundation cows of a herd should be good. A few good cows are worth far more than a greater number of inferior ones and this point is worth serious consideration. Poor producers should be consistently culled from the herd and replaced with better quality stock and great care should be taken to see that the safe stocking limit of the property is not exceeded. When a property is overstocked the animals are underfed and their health is endangered, while maximum production is impossible. In addition overstocking will result in severe losses should a drought occur. It should be borne in mind that the total production figures of a herd do not necessarily indicate the degree of economic success which a farmer is achieving; the real criterion is the production per cow or per acre.

Maintenance of a High Standard of Production.

Once a high standard of production has been reached it is obviously necessary to maintain it. The herd should be production tested for no culling programme can be successfully carried out without a knowledge of the production of each individual cow.

It is better to buy a good bull and raise heifers on the farm than to purchase elsewhere, provided the bull is capable of raising the standard of the herd. If possible, it is advisable to purchase an older bull which has proven itself capable of transmitting to its progeny those factors which will result in an increase in production. Where this can be done, it is better than buying a young bull and relying on pedigree, conformation and colour. A young bull may come of a long line of high producers and may conform to the standards for his breed in colour and conformation, but it does not necessarily follow that he will sire heifers which will be higher producers than their dams, although of course it must be admitted that such a bull has a much greater chance of doing so than one of nondescript stock.

Feeding of Stock.

There is always a time during the year when it pays to hand feed dairy stock even if to only a minor degree. Most farmers agree that a balanced ration should be fed but in practice very few do anything about it. In connection with cows in production the matter is governed largely by the availablity and cost of fodder, but in a normal season if a cow is in good heart when she freshens the feeding of a supplementary ration is regulated by the nutritive value of the natural pasture available. In practice it pays to feed some concentrates and the practical farmer will soon determine from his own experience what is the economic level of

supplementary feeding in his own particular circumstances. By the economic level of supplementary feeding is meant the degree of additional feeding which will give the greatest return for the expenditure involved. It will be readily understood that while additional feed may mean increased production the process cannot be continued indefinitely. A point will be reached where the increase in production will taper off and further increases in the ration become uneconomic.

Calves and young stock need to have paddock feed supplemented with concentrate or lucerne hay if they are to be given every chance of becoming profitable when they enter the milking herd. The growth of young stock should never be checked and in particular the heifer in calf for the first time should be well fed and cared for.

The needs of the dry cows should not be lost sight of. Paddocks should if practicable be subdivided for grazing in turn and where the grass is scarce or too dry and fibrous to maintain the dry stock in good condition, supplementary feeding is necessary. The dry cows are next season's milkers and the feed they receive prior to calving has an important bearing on their production during the ensuing lactation. The practice of putting dry cows in the poorest paddock on the farm instead of seeing that they have adequate nutritive feed is probably a major factor in the low average production of dairy cows in Queensland.

During cold weather it pays to rug milking cows. An example can be cited of two adjoining farms in Southern Queensland, both of which carried the same breed of cows. Both were feeding a supplementary ration. On one farm the milking herd was rugged and on the other it was not. The production of the rugged herd was well in advance of the unrugged herd and the cows showed much better condition. Rugging conserves a considerable amount of bodily heat which would otherwise have to be replaced from the foods consumed by the animals and in addition it was found that the rugged herd did not spend as much time in shelter during the colder weather, but commenced feeding much earlier than the unrugged one.

General.

All diseased stock should be at once culled from the herd and high standards of hygiene should always be maintained on a dairy farm. The progressive farmer will not allow diseased stock to mix with healthy animals or even permit them to remain on his farm, nor will he allow his good stock or their produce to be maintained in unsanitary surroundings. Too much stress cannot be laid on right dairy shed practices, which always include effective cleansing and sterilization of machines and utensils.

The construction of all improvements should be carefully planned and when this is being done future needs should not be lost sight of. Layout should be such that unnecessary work is reduced to a minimum. The conservation of fodder and water should be given special attention and improvements once installed should be kept in good order.

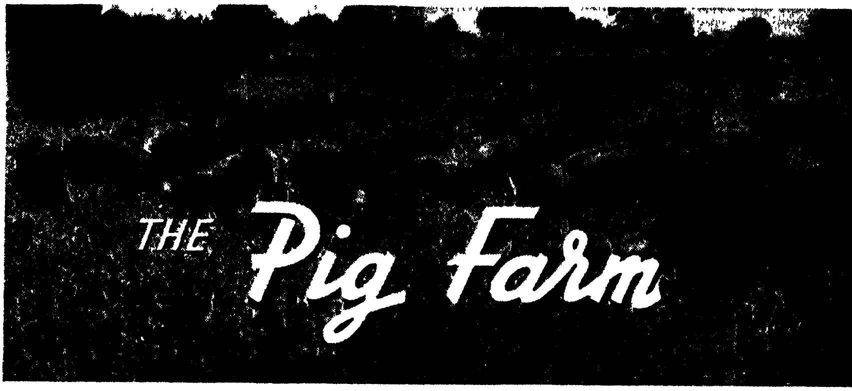
Dams should be deep rather than wide and shallow as this reduces loss of water by surface evaporation. They should be fenced in and the stock watered from troughs. The reasons for this are readily apparent. Cows heavy in calf suffer greatly in dragging through boggy dams and in climbing up and down the banks and this unnecessary exertion can result in losses from abortion. The organism which causes ropiness in

cream is often present in dams and still water and can be picked up by cows standing in the water to drink while of course the water readily becomes contaminated by the animals. When the water is troughed, it is cleaner and of more value to the stock. The expense of the troughing and pump is well worth while. A further point is that the water in a fenced dam lasts longer and the dam requires cleaning less often than an unfenced one.

Dairy buildings should be planned so as to allow proper cleansing with a minimum of work and time. Plenty of light and air is essential and provision should be made for a supply of water to the milking shed and bails for washing down the concrete floors and for plenty of boiling water or steam for cleansing utensils. Greater cleanliness makes for more choice grade cream and the greater the production of choice grade cream the greater is the cream cheque. Plans and specifications of suitable dairy layouts are available free of cost from the Department of Agriculture and Stock, Brisbane, or from officers of the Dairying Division of the Department in country centres.

The conservation of fodder deserves much more attention than many farmers give it. It is better to spend money providing fodder for use in dry times than to save it in the hope that droughts will not occur or that if they do occur it will be possible to buy whatever feed is necessary. In drought time feed available for purchase is scarce and usually poor in quality and high in price. It is far better to grow the crops during the good seasons and store them in the form of silage. Silage may be made in stacks, in pits and in concrete silos built above ground. Advice on making it may be had from the Department of Agriculture and Stock and where it is proposed to build the tower type of reinforced concrete silo the Department can make available on loan power driven concrete mixers, moulds and other necessary equipment.

In connection with fodder conservation it must be stressed that when it is proposed to purchase a dairy farm it is essential that one be selected which has land suitable for cultivation. It is a safe rule to have one acre of cultivable land for each cow in the herd though somewhat less will suffice where the land is of exceptional quality or irrigation is available. On the subject of irrigation, however, it is as well to sound a word of warning. Considerable equipment is necessary and effective irrigation takes a great deal of time which cannot always be spared on a dairy farm. In most of the dairying districts of Queensland reasonable summer rains can be expected and it is sometimes better to practice methods of cultivation which conserve soil moisture and grow fodder crops during the summer months and store them in the form of silage.



Pig Feeding Trials on the Atherton Tableland.

A. L. CLAY, B.V.Sc., Divisional Veterinary Officer and C. J. McKEON, Q.D.A., Director of Agriculture.

SOME years ago pig feeding trials, using maize and skim milk and maize and meat meal, were carried out on the Atherton Tableland by the writers. Although these trials were designed only as preliminary experiments and have not so far been followed up, it is felt that the results obtained notwithstanding will be of interest at this time when the overall shortage of pig meats is so acute.

In the preliminary trials, the main points under investigation were—

1. *To determine whether a suitable type of bacon carcase could be produced with maize as the predominant constituent of the concentrate portion of the ration.*

It has been frequently stated that maize produces soft, oily, yellowish fat in pigs, and as a result, has been adjudged inferior to the other cereals to such an extent as to make it appear advisable, if not essential, to feed with it at least some wheat, barley, or other cereal. Maize, however, is the only cereal readily available on the Atherton Tabeland, and it therefore appeared essential to determine whether balanced rations using this grain as the only cereal could produce a carcase suitable for market requirements.

2. *To demonstrate whether the dairy farmer could purchase and/or produce maize and feed it profitably to pigs.*

Most dairy farmers appreciate the fact that maize can be fed profitably if it can be purchased at a satisfactory figure. Few of them, however, have any conception of its value in terms of pounds of bacon, or in other words, what live weight of pig a given quantity, say a ton, will produce. Without this information the farmer is not in a position to know at what price he can purchase maize profitably for the production of pork or bacon. It is generally accepted that maize is a useful supplement to skim milk, but it is not generally known what may be considered the correct quantities to feed at the various stages of growth. As a result quantities in excess of those actually required are sometimes fed: this is not only a wasteful practice, but has a very definite tendency to produce an inferior type of carcase.

Dairy farmers on the Atherton Tableland may purchase maize through two main avenues, viz., direct from the Atherton Tableland Maize Board, and through the North Queensland Co-operative Bacon Association. In this latter case it would be in the interests of producers, if the two organizations named could come to an agreement, whereby, given that a fixed minimum would be purchased during any one year, a fixed and reasonable rate would obtain throughout the year. Pig producers would then be assured of constant and more satisfactory rates for maize than have existed hitherto. Increased confidence would result, and the production of pigs be therefore stimulated.

3. *To demonstrate whether the maize farmer could feed maize, in the absence of skim milk, more profitably to pigs than he could dispose of it through the usual channels.*

This is very far from being a matter of general acceptance. The question at issue here would be, of course, dependent in most cases on the ability of maize farmers to purchase additional weaner pigs from the dairy farming areas of the Tableland. On the other hand most maize farms could maintain a small number of cows, with the object of supplying milk to brood sows and thus become independent.

Plan of the Trials.

Five pigs were used in each trial and were fed and housed jointly throughout, from weaning until marketed. Actual farm conditions obtained, no special conditions being observed other than that known quantities of food material were given each day.

The pigs used in the trial could not by any stretch of the imagination be regarded as ideal; in fact in the case of one trial (maize and skim milk) they did not even approach the ideal. No attempt was made to select a type of pig which would be likely to give enhanced results. In order to reduce the special labour conditions involved in regularly weighing small quantities of food, suitable containers were designed and cut to hold the required amount of foodstuff, so that the farmer simply had to fill a tin each time the pigs were fed.

The rations used, together with their total digestible nutrients and nutritive ratio, were as follows:—

1. *Maize and Skim Milk* for each pig—

35-40 lb. pig:	Maize 1.2 lb. Skim Milk 5.5 lb.	T.D.N. 1.52 N.R. 1: 4.3
75 lb. pig:	Maize 2.3 lb. Skim Milk 6.5 lb.	T.D.N. 2.56 N.R. 1: 5.3
125 lb. pig:	Maize 3.5 lb. Skim Milk 8.0 lb.	T.D.N. 3.73 N.R. 1: 5.8

2. *Maize and Meat Meal* for each pig—

35-40 lb. pig:	Maize 1.5 lb. Meat Meal 0.3 lb.	T.D.N. 1.55 N.R. 1: 4.3
75 lb. pig:	Maize 2.6 lb. Meat Meal 0.3 lb.	T.D.N. 2.50 N.R. 1: 5.3
125 lb. pig:	Maize 4.0 lb. Meat Meal 0.4 lb.	T.D.N. 3.78 N.R. 1: 5.9

In each case as much green herbage (but no lucerne or other leguminous crop) as could be eaten comfortably was allowed daily.

Results of the Trials.

The results are as set out below and four different methods have been used to calculate a value for maize per ton. The farmer who does not rear pigs, and therefore has to purchase weaners in order to feed maize for the production of bacon, will naturally regard the figure obtained in Method 3 as the one most likely to be representative of the value of maize under his conditions. On the other hand the farmer who rears his own pigs would appear to be justified in accepting the figure arrived at in Method 4. Method 2 is of less practical interest, but is given in order to cover the results from additional angles.

A value of 10d. per lb. dressed weight for bacon carcases has been used in calculating the value of maize per ton, but, of course, the methods are applicable whether bacon be taken to be worth more or less than this figure.

MAIZE AND SKIM MILK.

Live weights as at:

1. 30th March, 1936—Total, 190·5 lb.; average, 38·1 lb.
2. 11th May, 1936—Total, 333·0 lb.; average, 66·6 lb.
3. 15th June, 1936—Total 523·0 lb.; average, 104·6 lb.
4. 3rd August, 1936—Total, 783·0 lb.; average, 156·6 lb.

NOTE: Age at commencement of trial (weaning) 9 weeks.

Gain in live weights from 30th March, 1936, to:

1. 11th May, 1936—Total, 142·5 lb.; average, 28·5 lb.
2. 15th June (77 days)—Maize, 654·5 lb.; skim milk, 2,292·5 lb.
   (11th May to 15th June—35 days—total, 190 lb.; average, 38·0 lb.)
3. 3rd August, 1936—Total, 598 lb.; average, 119·6 lb.
   (15th June to 3rd August—49 days—total 265·5 lb.; average, 53·1 lb.)

Feed consumed (5 pigs) from 30th March to:

1. 11th May (42 days)—Maize, 252·0 lb.; skim milk, 1,155 lb.
2. 15th June (77 days)—Maize, 654·5 lb.; skim milk, 2,292·5 lb.
   (11th May to 15th June—35 days—maize, 402·5 lb.; skim milk, 1,137·5 lb.)
3. 3rd August (126 days)—Maize, 1,512 lb.; skim milk, 4,552·5 lb.
   (15th June to 3rd August—49 days—maize, 857·5 lb.; skim milk, 1,960 lb.)

Daily live weight gain per lb. maize from 30th March to:

1. 11th May, 0·6 lb.
2. 15th June, 0·5 lb.
   (11th May to 15th June, 0·5 lb.)
3. 3rd August, 0·4 lb.
   (15th June to 3rd August, 0·3 lb.)

Value of maize per ton, calculated by four different methods—

METHOD 1.

1,512·0 lb. of maize and 4,252·5 lb. of skim milk produced 598·0 lb. of live pork (see above).

By simple proportion, 1 ton maize and 6,299 lb. of skim milk would produce 886 lb. of live pork or 620 lb. of bacon carcase (70 per cent. of live weight).

620 lb. at 10d. per lb. is worth £25 16s. 8d.

Value of 6,299 lb. of skim milk is £5 5s. 0d. (630 gals. at 2d. gal.); 1 ton of maize is worth £20 11s. 8d. (£25 16s. 8d. less £5 5s. 0d.).

METHOD 2.

1 lb. of maize produced 0·4 lb. of live weight pork.

By simple proportion, 1 ton of maize produced 896 lb. of live weight pork or 627 lb. of bacon carcase (70 per cent. of 896).

627 lb. at 10d. per lb. is worth £26 2s. 6d.; deduct £5 5s. 0d. for skim milk as in Method 1 and the value of 1 ton of maize is £20 17s. 6d.

METHOD 3.

Dressed weight totalled 589 lb.

589 lb. at 10d. per lb. is worth £24 10s. 10d.

Value of pigs at weaning, £10 (five at £2 each).

By difference, £14 10s. 10d.

1,512 lb. of maize and 4,252 lb. of skim milk are worth £14 10s. 10d. By simple proportion, 1 ton of maize and 6,299 lb. of skim milk are work £21 12s. 3d., from which has to be deducted £5 5s. 0d. foı skim milk (as in Method 1).

The value of 1 ton maize is £16 7s. 3d.

METHOD 4.

Estimated total weight of dressed carcases of pigs in the group as at commencement of feeding trial—133 lb. (70 per cent. of 190·5 lb.); 133 lb. at 10d. per lb. is £5 10s. 10d.

By difference (£24 10s. 10d. and £5 10s. 10d.), 1,512 lb. of maize and 4,252 lb. skim milk are worth £19.

By simple proportion 1 ton of maize and 6,299 lb. of skim milk are worth £28 12s. 11d.

Deduct £5 for skim milk (as in Method 1) and 1 ton of maize is worth £23 7s. 11d.

The average of the above four figures for maize is £20 6s. 1d.

NOTE: Dressed weight totalled 589 lb. which at 10d. per lb. is £24 10s. 10d.

MAIZE AND MEAT MEAL.

Live weights as at:

1. 23rd March—Total, 164·5 lb.; average, 32·9 lb.
2. 11th May—Total, 318·5 lb.; average, 63·7 lb.
3. 15th June—Total, 501·5 lb.; average, 100·3 lb.
4. 27th July—Total, 764·0 lb.; average, 152.8 lb.

Gain in live weights as at:

1. 11th May—Total, 154·0 lb.; average, 30·8 lb.
2. 15th June—Total, 337·0 lb.; average, 67·4 lb.
   (11th May to 15th June—35 days—total 183·0 lb.; average, 36·6 lb.)
3. 27th July—Total, 599·0 lb.; average, 119·9 lb.
   (15th June to 27th July—49 days—total 262·5 lb.; average 52·5 lb.)

Feed consumed (5 pigs) from March 23rd to:

1. 11th May (49 days)—Maize, 367·5 lb.; meat meal, 73·5 lb.
2. 15th June (84 days)—Maize, 822·5 lb.; meat meal, 126·0 lb.
   (11th May to 15th June—35 days—maize 455 lb.; meat meal, 52·5 lb.)
3. 27th July (126 days)—Maize, 1,662·5 lb.; meat meal, 210·0 lb.
   (15th June to 27th July—42 days—maize, 840 lb.; meat meal, 84 lb.).

Live weight gain per lb. maize from 23rd March to:

1. 11th May, 0·4 lb.
2. 15th June, 0·4 lb.
   (11th May to 15th June, 0·4 lb.)
3. 27th July, 0·4 lb.
   (15th June to 27th July, 0·3 lb.)

Value of maize per ton, calculated by four different methods—

METHOD 1.

1,662 lb. of maize and 210 lb. meat meal produced 599 lb. of live pork (see above).

By simple proportion, 1 ton maize and 283 lb. meat meal produces 808 lb. of live pork or 566 lb. baconer carcase (70 per cent. of live weight).

566 lb. at 10d. per lb. is £23 11s. 8d.

Deduct £2 2s. 5d. for 283 lb. meat meal (£15 per short ton) and 1 ton of maize is worth £21 9s. 3d. (£23 11s. 8d. less £2 2s. 5d.).

METHOD 2.

1 lb. of maize produced 0·4 of live pork.

1 ton maize produces 896 lb. of live pork or 627 lb. bacon carcase (70 per cent. of 896 lb.).

627 lb. at 10d. per lb. is worth £26 2s. 6d. Deduce £2 2s. 5d. for meat meal as in Method 1, and the value of 1 ton maize is £24 0s. 1d.

METHOD 3.

Dressed weight totalled 552 lb.

552 lb. at 10d. per lb. is worth £23.

Value of pigs at weaning age, £10 (five at £2 each).

By difference, £13; 1,662 lb. maize and 210 lb. meat meal is worth £13.

By simple proportion, 1 ton of maize and 283 lb. meat meal are worth £17 10s. 6d.

Deduct £2 2s. 5d. for meat meal as in Method 1 and the value of 1 ton of maize is £15 8s. 0d.

METHOD 4.

Estimated total weight of dressed carcases of pigs in the group as at commencement of feeding trial—115 lb. (70 per cent. of 164·5 lb.).

115 at 10d. per lb. is £4 15s. 10d.

By difference (£23 and £4 15s. 10d.), 1,662 lb. maize and 210 lb. meat meal are worth £18 14s. 2d.

By simple proportion, 1 ton maize and 283 lb. of meat meal are worth £25 14s. 3d.

Deduct £2 2s. 5d. for meat meal (as in Method 1) and 1 ton maize is worth £23 1s. 10d.

Average of above four figures for maize is £20 19s. 9d.

NOTE: Dressed weight totalled 552 lb. which at 10d. per lb. equals £23.

Remarks.

For the first six or eight weeks of the trials it was very evident that the pigs were not getting as much foodstuffs as they required, and we were led to the belief that increased amounts could have been given during this period, and that these increased amounts would have been efficiently utilized—that is to say, that greater gains in live weights would have been obtained within the period stated. This in turn would have shortened the latter stages of growth in which the returns (in terms of live weight gains per lb. maize) were not so high as in earlier stages of growth. The returns over the whole of the growing period might conceivably therefore have been improved.

At the conclusion of the trials the pigs were slaughtered by the North Queensland Co-operative Bacon Association and a searching examination of the carcases made. The maize and meat meal fed pigs showed a faint yellowish discolouration of the fat, but the fat was quite firm and favourably proportioned as to lean, all five pigs being highly satisfactory in that respect. The general quality of the carcases was excellent.

The maize and skim milk fed pigs showed no discoloration of the fat, which was again quite firm and favourably proportioned as to lean, except in the case of one pig which included too much Berkshire in its make-up. The general quality of the carcases was very good but not quite up to the other group. In fairness to the maize and skim milk group, however, it must be stated that their rivals were a much better class of pig at the commencement of the trial, and any difference in the quality of the carcases would more properly be ascribed to this cause.

As a matter of general interest it can perhaps be mentioned that at the time the trials were carried out (1936) the average of the four figures for the value of maize in the maize and skim milk trial (using then current costs and prices) was £10 9s. 3d. per ton, and in the maize and meat meal trial £10 13s. 9d. per ton. At that time there was not the same big discrepancy in the figure obtained using method 3 as compared with the other methods. This indicates that the cost of weaners has risen out of all proportion to the price of pig meats and pig foods in general. This in turn underscores the shortage of breeding stock at the present time.

Conclusions.

1. A type of carcase suited to market requirements can be produced by feeding a balanced ration using maize as the only cereal, in conjunction with, or in the absence of, skim milk.

2. As regards the profits to be made by feeding maize as above, no conclusions are to be made at this stage, but it is suggested that sufficient information has been gained to lead to the belief that, given the appropriate class of pig to begin with, very considerable profit can be expected.

Acknowledgments.

It is desired to acknowledge the co-operation of Messrs. R. Stockman, Kairi, and H. Turner, Tarzali, in the conduct of these trials; also the Atherton Tableland Maize Board and the North Queensland Co-operative Bacon Association for supplying the necessary financial assistance. Thanks also are due to Messrs. W. H. Bechtel, formerly Instructor in Agriculture, Atherton, and S. Pegg, formerly Dairy Inspector at Atherton, for their co-operation at various times. To Mr. F. Bostock, Officer in Charge, Pig Branch, thanks also are due for bringing the figures quoted herein into line with current costs and prices.

Breeders' Baconer Competition.

The Royal National A. & I. Association has included a new class in its Pig Section Schedule to be known as "Breeders' Baconer Competition." Entries for the competition close on 1st June, 1948.

The new class will consist of an entry of one baconer pig either pure bred or sired by a pure bred boar, to weigh 120 lb. to 160 lb. dressed weight. The pig must be killed and cured by a recognized bacon factory. All exhibits will be judged in the form of a side of bacon on conformation and suitability to modern trade requirements in accordance with the Inspection and Measurement Standards of Great Britain. Processing, flavour, smoking and trimming will not be taken into account. Prizes, £50: viz. first, £10; second, £9; third, £8; fourth, £7; fifth, £6; sixth, £5; seventh, £3; eighth, £2.

Delivery of pigs must be made to any recognized bacon factory before 1st June. The factory will arrange to have exhibits forwarded to Brisbane so as to reach Showgrounds by Wednesday, 5th August.

All exhibits must be clearly branded on each side near the shoulder. Points will be deducted for bad branding.

Exhibits will be weighed in accordance with the usual factory practice and a margin of 5 lb. either over or under the specified weights will be allowed.

Factories concerned will purchase the pigs at ruling factory prices and they will become the property of the respective factory. The Royal National Association will pay ½d. per lb. of side above the ruling price to compensate for loss of value through mutilation.

In the past many breeders have complained that they cannot afford to have three high quality pigs slaughtered, but in this case producers are asked to submit only one. However, two may be entered if desired. A competitor may thus become his own judge when selecting what he considers his best baconer. The pig selected has to be delivered to a bacon factory on or before the 1st June, 1948, when it is to be slaughtered and its carcase put through the normal curing process.

At the Show it will be appraised in the form of a side of bacon on conformation and its suitability for trade requirements according to conditions as set out in the schedule. All bacon factories throughout the State have been asked to co-operate and are requested to keep a list of the carcase weights and identification marks of each pig entered for the competition. Factories also are asked to cure competitors' pigs as sides and leave the first rib and aitch bone intact when dressing for curing. The carcase weight, first rib and aitch bone are most important in the appraisal work.

A competition such as this provides breeders with an opportunity of completing the exhibition of their pigs. In the Pig Section they are able to show breeding stock and their progeny, while by an entry in this class are able to demonstrate the commercial quality of their pigs in the form of the finished product. In addition, each exhibitor is able to determine just how correct he was in his judgment when selecting the pig he thought was an ideal baconer. Therefore, breeders are urged to support this competition.

PLANT PROTECTION

Strawberry Planting Material.

INVESTIGATIONS made in 1947 revealed that virus diseases constitute a real problem in the strawberry industry in Queensland. The scheme for providing approved strawberry planting material was carried through successfully on a small scale last year and it is proposed to attempt a similar system for approval of runner beds during 1948. Nominated crops will be inspected by Departmental officers and at the end of the season the names of growers having an approved source of runners will be published in "The Queensland Agricultural Journal" and the "Fruitgrower's Gazette."

Any grower desirous of having his strawberry runner bed approved by the Department of Agriculture and Stock should prepare the information required under the following headings and forward this to the Department not later than the 14th May, 1948.

Particulars required:—

(1) Name in full.

(2) Address.

(3) The area of the plot from which it is intended to sell runners.

(4) Source of the runners used to plant the present crop.

The strawberry grower will have to be prepared to undertake the following matters relating to his side of the work:—

(1) To keep the plants reasonably clean at all times, including the period from the time the crop finishes to the digging of runners.

(2) To rogue out all virus infected plants at not greater than fortnightly intervals.

(3) To permit the roguing of virus infected plants by the inspecting officer.

(4) To apply such insecticides and fungicides as may be necessary or as the inspecting officer may suggest.

(5) To accept the standards laid down with respect to freedom from disease.

(6) If listed as an approved grower to sell only such runners as are approved.

(7) To make his own arrangements for the sale of his runners.

The Department of Agriculture and Stock will undertake to inspect strawberry crops for the purpose of determining whether they conform to the standards required for approval. The Department reserves the right to restrict these inspections to the number of crops which can be adequately handled and to those with a reasonable chance of being successful.

The following standards will apply:—

(1) At the first inspection (preferably during the month of June) a tolerance will be allowed of not more than
 2% plants affected with virus
 nil plants affected with root disease.

(2) At the time of subsequent inspections a tolerance of not more than
 0.5% plants affected with virus
 nil plants affected with root disease
 5% plants affected with off type characters.

(3) The Department reserves the right to reject a crop where in the opinion of the inspector diseases or pests other than those mentioned above are in sufficient abundance to render the planting material of poor quality.

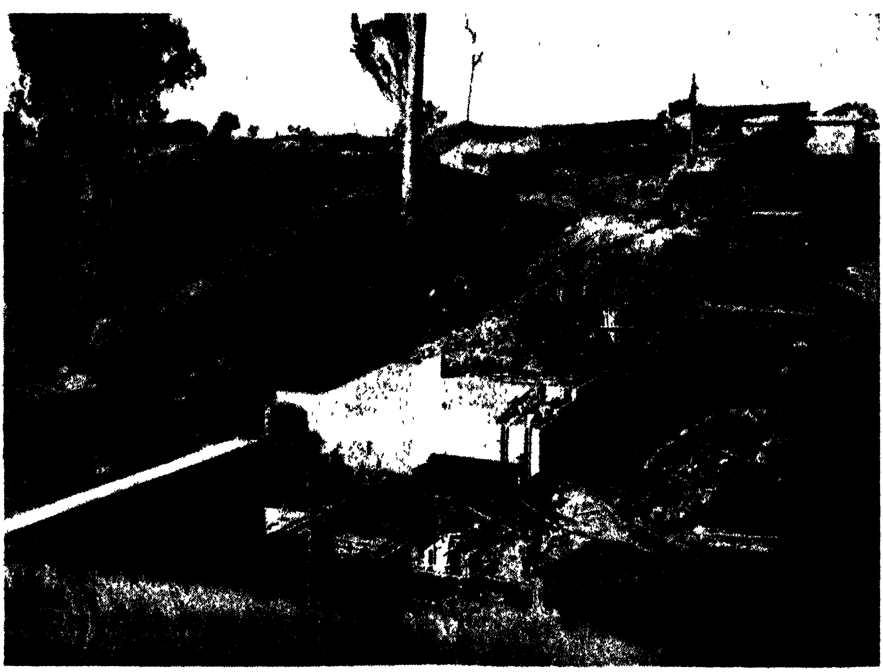


Plate 94.

WEIR UNDER CONSTRUCTION ACROSS THE LOCKYER.

MARKETING

World Fibre Survey.

The following is extracted from a world fibre survey published by the Food and Agriculture Organisation of the United Nations:—

"In 1946-47 world production of the five major clothing and household fibres —cotton, wool, silk, flax and rayon—was 24 per cent. below the 1934-38 average. Because the carry-over of cotton and wool at the beginning of the season was larger than normal, the total supply of those fibres was about the same in 1946-47 as in 1934-35. World production in 1947-48 should be a little higher than in 1946-47 but still considerably below pre-war figures. Taking account of world stocks in mid-1947, it is estimated that effective supply in 1947-48 will be slightly less than pre-war for cotton, though considerably higher than pre-war for wool."

Production Trends—March.

Dairy stock are approaching the winter in good condition. Some deterioration in milk and cream quality resulted from the hot humid weather, but prospects for April are good, and production should be well maintained.

Harvesting of early planted maize crops continued during March. Early crops in the Fassifern, Lockyer and Darling Downs are yielding fairly well, but it is expected that the yield from later crops will be lighter.

The bulk of the grain sorghum crop has been harvested. Total production is expected to be less than 1,000,000 bushels.

Harvesting of early planted peanuts continued throughout March. Yields generally are only fair.

Cotton picking operations commenced during March. The ginneries opened for receivals after Easter, and consignments are now being received.

Practically the whole of the pastoral areas, with the exception of the Central-Western Division, received useful rains during March. Generally speaking, stock are in excellent condition.

European Wheat Harvest.

The International Federation of Agricultural Producers estimates the 1947 European (excluding U.S.S.R.) wheat harvest at 15,190,000 bushels. This compares unfavourably with the 1946 harvest of 19,413,125 bushels, and is even less than the 1945 crop of 15,500,000 bushels. Average for the pre-war period 1935-39 was 25,363,125 bushels.

Dutch Flowers by Air to New York.

A short time ago a large consignment of lilacs arrived in New York by K.L.M. airlines from Holland. The flowers were on sale the following day in the New York florists. The total travelling time from Amsterdam to New York was only 15 hours thirty minutes. A spokesman of the airline company K.L.M. in New York stated that during the season weekly consignments of lilacs and tulips would be imported from Holland by plane.

The Barley Marketing Board.

The only nominations received in connection with the election of two growers' representatives on the Barley Marketing Board for a period of three years from 24th April, 1943, were those of the present sitting members, namely:—

Mr. Justus Heinrich Kessler, Bloomfield, Nobby.

Mr. Phillip David Fiechtner, jun., Greenmount.

No petition for a poll on the question of the extension of the Board's operations for a period of six years from 24th April, 1948, has been received.

Mill Peak Appeals.

Appeals by mills and growers under Section 12A of *The Regulation of Sugar Cane Prices Acts*, 1915 *to* 1941, for increased mill peaks were heard by the Central Sugar Cane Prices Board on the 24th March, when the Board dismissed the appeals and recommended to the Minister for Agriculture and Stock that the mill peaks for the 1948-49 season remain as at present and be not altered either in the case of any individual mill or in the aggregate peak of 737,000 tons. This recommendation has been approved by the Governor in Council.

GENERAL NOTES

Staff Changes and Appointments.

Mr. J. L. Clayton, M.Sc.App., Senior Mill Technologist in the Bureau of Sugar Experiment Stations, Department of Agriculture and Stock, is on his way to Hawaii for a period of three months, where he will investigate, on behalf of the Bureau, methods of low-grade massecuite treatment in sugar manufacture, methods of bulk handling of raw sugar, and milling problems associated with the handling of mechanically harvested cane. It is anticipated that the results of Mr. Clayton's investigations will be available prior to the commencement of the crushing season.

Mr. J. Purcell (Toowoomba) has been appointed Chairman of The Dairy Products Stabilisation Board for a period of three years till 31st January, 1951.

Soil and Water Conservation—Taxation Deductions.

The Minister for Agriculture (Hon. H. H. Collins) has announced that, following representations by the Queensland Government, the Commonwealth Taxation Department had now conveyed formal advice regarding taxation deductions allowable to primary producers in respect of expenditure in combating erosion and the provision of water facilities.

The new schedule provides that expenditure incurred in the year of income by a taxpayer engaged in primary production *on any land in Australia* in:—

(*a*) preventing or combating soil erosion on the land, otherwise than by the erection of fences;

(*b*) the construction of dams, earth tanks, underground tanks, irrigation channels or similar structural improvements, or the sinking of bores or wells, for the purpose of conserving or conveying water for use in carrying on primary production on the land; and

(*c*) the construction on the land of levee banks or similar improvements having like uses,

shall be an allowable deduction.

Swing Towards Farming.

Most interesting feature of a survey of the labour position in Hawke's Bay made by Mr. A. J. Peterson, district officer of the Department of Labour and Employment at Hastings, was that there had been a surprising trend from secondary industries to primary industries recently. Town workers were realising that life on wages under the present high cost of living was not conducive to saving, and many of them were actually endeavouring to turn to farm work.

Finding that there was no shortage of farm labour in the Hastings district, Mr. Peterson concluded that a factor influencing this happy state of affairs was the existence in the area of some of the finest single and married accommodation in New Zealand. Most of the stations and farms throughout Hawke's Bay had splendid single quarters, while in many instances the homes provided for married workers and their familes were up to the standard of State houses in the town areas.

With meat, milk, firing and, in many instances, other items provided free or for a nominal charge, workers on farms to-day were in a far better position than their contemporaries in the urban areas, Mr. Peterson claimed. It was this state of affairs which had prompted a spate of inquiries for positions on farms where accommodation could be provided from workers in industrial jobs.—P.H., in *The New Zealand Farmer.*

Rural Topics

Greenfeed for Poultry.

With the rise in cost of poultry foodstuffs many poultrymen are inclined to seek methods by which the feeding costs of their flocks can be reduced it was stated at the Department of Agriculture and Stock to-day. The use of greenfeed helps materially in reducing feeding costs, and at the same time supplies many of the essential vitamins.

All greenfeeds are good in moderation, but with some there is a risk of affecting egg quality. Among these is rape, which if fed excessively causes discolouration of the yolk, referred to as "olive yolk." Rye also is credited with having a similar effect.

A recent case of over-feeding of rape came under notice. A farmer, with the object of reducing feed costs, turned his birds on to a luxurious crop of rape with the consequence that within a very short time a large percentage of eggs had olive yolks. The loss in quality cost this farmer from £4 to £5 a week for some weeks, as the trouble cannot be corrected immediately the birds are removed from the rape.

Yolk colour is an important feature in egg quality. Light yolks are undesirable, but on the other hand eggs with too dark a yolk are not classified as first quality. Greenfeed gives colour to the yolk, but it is necessary to exercise some control over the amount of greenfeed eaten to produce eggs with yolks of the right colour. All greenfeeds do not contain the same amount of colouring pigment. Eggs used for home consumption should be regarded by the farmer as a guide to yolk colour.

Quality in Cream.

Of the various defects which result in cream being graded other than "choicest," it is surprising how many are caused wholly or in part to uncleanliness in some connection. Absolute cleanliness is the first law in profitable dairying and a substantial proportion of the remedies for common cream faults come under this heading. Following are some hints on other aspects of prevention:—

Cool all cream promptly after separating.

Do not expose cream or cans to the direct rays of the sun.

Deliver to the factory frequently—not less than four times weekly. Deliver daily in summer time.

If possible, send all the cream in the dairy on days of delivery; any kept over should be kept as cool as possible.

Do not mix fresh cream with older cream until the former has been cooled. Give the whole an occasional stir to make the mass uniform, and stir at least four times daily.

Prevent cows from wading in stagnant water; udders of cows should be washed and wiped before milking.

At least once a day remove all cow droppings 100 feet from dairy, yards, and bails.

Never use milk from sick cows or from cows too soon after calving.

Use clean, sound brushware only in cleaning utensils—never use cloths.

Use only smooth, well-tinned tinware and cans, with all seams soldered flush.

If possible, keep cows away from rank or objectionable flavoured weeds. Feed cows at least two hours prior to milking—better still, feed just after milking.

Do not send a very small quantity of cream to the factory in a can of large capacity if any distance is to be travelled.

Have the engine outside the separating room, and extend the engine exhaust to blow clear of the building. Keep smoke away from the dairy, and all strong-smelling material out of the dairy. On no account use water that has been heated in the engine jacket for washing.

Do not use strong-smelling disinfectants in water for washing.

GADGETS AND WRINKLES

COMFORT FOR CATTLE.

The dairy farmer who rugs his cattle during wintry weather usually reaps the advantage of an undiminished cream return. Many other farmers would like to follow suit but are deterred by the cost of buying a good, warm rug. There is no reason, however, why a farmer so placed should not make his own rugs. All that is required are the necessary number of cornsacks, a ball of twine, a packing needle, and ordinary ingenuity.

A warm rug can be made out of two cornbags, but for a big beast three bags might be necessary. Split the bags down the seams, sew them together and place on the cow. After getting the right fit, cut off a strip of bagging so that the rug will not hang too low. This strip cut off may then be folded and sewn to the rug as a thigh strap. The front of the rug is then fitted by turning up the corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion, which the cow would otherwise tread on. Neck and other fastenings may be easily fashioned to make the rug complete.

This home-made rug will keep the cow warm, and after a few days' wear will become practically waterproof. The rug can be slipped off and on quite easily, and it is advisable to remove it every day, except in bleak or rainy weather. Each cow's name may be painted on its own rug.

NESTS FOR POULTRY.

It is difficult to design a standard nest suitable to the various types of poultry houses, but some poultry farmers could do more than they are doing to improve nesting facilities. Much of the wastage caused by dirty, cracked, broken, and heat affected eggs, and egg eating, is the result of poor nesting accommodation.

Nests should be arranged inside the pens on the partition walls and away from the weather. Place them about two feet from the ground so that they do not take up floor space. Gathering of eggs should be done several times a day. Cover the nests to keep them fairly dark and secluded, and make sure that the cover has sufficient slope to prevent the birds from roosting on it. The nests should be closed at night to prevent the fowls from roosting in them. One nest should be allowed for every six or seven birds if individual nests are used. If community nests are installed, allow 4 feet 6 inches by 2 feet for every 50 birds. Make the nests 10 to 12 inches deep, so that the litter cannot be scratched out. Clean, light litter, such as rice hulls, is suitable nesting material.

Clean, roomy, secluded nests ensure clean eggs. Small, dirty, open nests are the cause of many dirty and broken eggs.

Eggs are a valuable food and are needed urgently.

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FENCE CORNER BRACING.

The most vital part of a permanent farm fence is the corner arrangement. A plan commonly in use on farms has a diagonal brace and a twisted wire truss, as shown on Plan A. With this plan the brace timber tends to push up on the top end of the corner post, and the wire truss pulls on it at the bottom. Where the fence wire is stretched it has the brace timber leverage as well as the twisted wire truss to raise post No. 2. Then a brace timber extends diagonally from one foot below the top of post No. 2 to post No. 1 at a point about one foot above the ground.

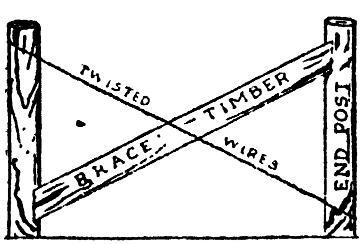
Twisted-wire stays are used for economising the number of posts and to strengthen the barbed-wire strands in support of woven wire between the posts. It is surprising what strength these little things can add to a fence.

Plan B shows a corner-post arrangement that is coming into quite general use, and is much better than Plan A. By using extra heavy posts in the ground it constitutes a very substantial corner. With light posts it is better to have two horizontal brace timbers instead of one as indicated. One brace timber should be located about a foot below the top of the two posts, and the other brace timber one foot above the ground line between the two posts. The only objection to this corner is that two posts have to take the whole strain of the fence, which is considerable when woven wire is used. Plan B is a very good corner for barbed wire, but hardly sufficient for woven-wire fence.

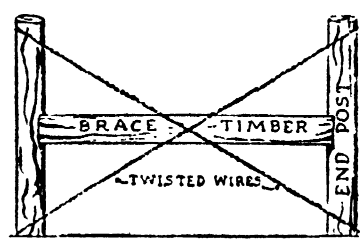
A three-post bracing system is shown in Plan C. This system avoids the tendency of the usual corner post to life when the fence is stretched, and distributes the pulling strain on three posts instead of two. The three posts are set in a straight line in order of 1, 2, 3, and can be numbered for explanation, with No. 2 as the corner post. Such posts should be eight feet in length. They can be spaced according to the length of bracing timbers available.

Use a horizontal brace timber between posts Nos. 2 and 3 about one foot from top. By using two truss wires to post No. 3 from post No. 2, extending diagonally between the two posts and crossing in the centre between these posts, the twisted-wire braces neutralise each other in bearing the fence strain or pull. For compact soil no horizontal timber near the ground is necessary, but for loose ground, when stretching woven wire, it may be advisable to place a second brace timber six inches above the ground.

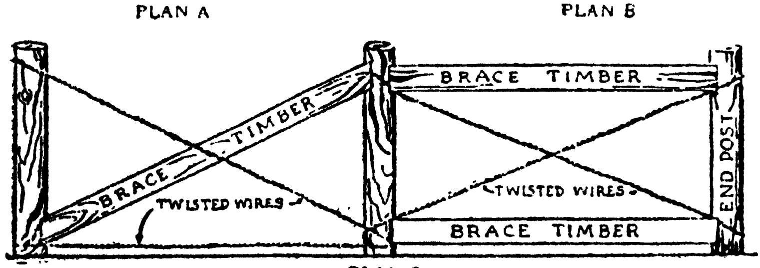
Post No. 1, located as first of the three posts, should be wired to post No. 2 with a horizontal twisted wire six inches above the ground to keep it from creeping. This No. 1 post is connected with post No. 2 by a twisted-wire brace from near its top to the bottom of regions. You can drive a split post easily, but it is difficult to drive a large round post. These small fence posts should be driven with the small end down, after being sharpened.



PLAN A

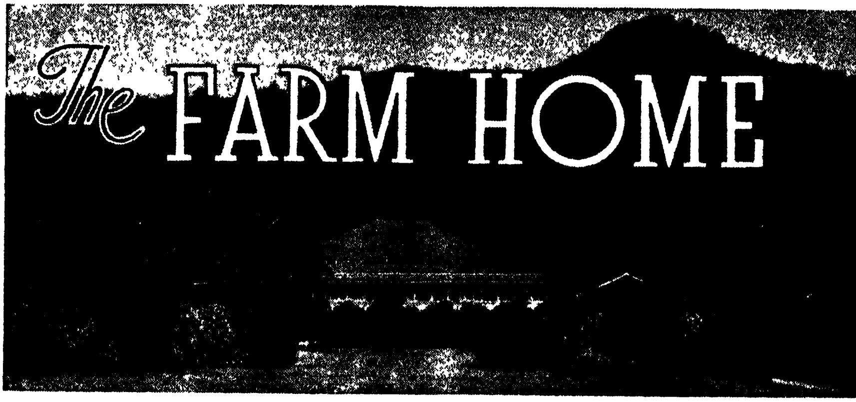


PLAN B



PLAN C

Three fence-corner arrangements. Plan C is new and carries well the strain of woven wire.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

TEACH YOUR CHILD TO BE INDEPENDENT.

THE time comes when every child must stand alone in the world. Therefore, he must be taught from an early age to face his own problems and turn them into stepping stones to success. Sound bodily health and good intellectual equipment are an excellent foundation for a happy, successful life, but even with these it is a great handicap if a young person is constantly fearing that he will fail and being always dependent upon other people for encouragement and reassurance and help.

In these days of small families and higher standards of living there is the danger that mothers and fathers will not only supply all their children's actual wants and therefore do for them many things which they are quite capable of doing for themselves, but will also create in them appetites and demands which would be better left to develop slowly and at a later date.

There are, of course, certain obvious pitfalls which confront parents in the task of training their children to be independent. Perhaps the greatest is the pleasure and satisfaction which they get out of serving their children and trying to make them happy. This satisfaction, unless intelligently controlled, will hold the child back in his development. Some parents fear that a child is too young to do this or that for himself or that he will get hurt, and later on they are afraid he may mix with bad people and pick up bad language. These are chances which must be taken and a child must be taught to accept his share of the responsibility as he grows older. Unless he does this he will become a shirker.

Certainly children should be carefully led into each situation which is strange and new whether it be the first attempt on his new slippery slide or his first paddle in the sea. We all tend to be cautious in facing new experiences and if this primary fear is wrongly dealt with it may carry through into adult life. In the same way, if we are wisely helped to adjust to new situations we get satisfaction and pleasure from feeling that we are strong enough to face up to them and so we tend to be happy about repeating them.

Success and praise are a wonderful stimulant to us all, so praise a child for each new achievement whether it be putting on his own socks, fastening his own braces or making a sand castle. On the other hand, if he fails encourage him to try again, but do not do it for him. Help should only be given when the difficulties prove too great.

Mothers should remember that children learn slowly by doing the same things themselves over and over again. It takes time and patience while the child is learning, but saves you both hours of time later.

Provide clothes that are simple and easy for the child to manage and do not be impatient if he makes a mess when he is learning to feed himself. Do not always decide for him—let him choose his own games, where he will go for a walk and so on. Let him say what *he* thinks sometimes instead of always telling him what *you* think. You can do a great deal for your child's future by starting him on the road to independence now.

Any further advice on this and other matters connected with children may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's terrace, Brisbane*, or by addressing letters, *Baby Clinic, Brisbane*. These letters need not be stamped.

IN THE FARM KITCHEN.

Savoury Suet Pudding.

Eight ounces flour, 4 oz. suet (or dripping), 4 oz. of finely chopped meat, 1 tablespoon finely chopped parsley, 2 good teaspoons baking powder, ½ teaspoon powdered herbs, salt and pepper, 2 oz. chopped onion. Mix all dry ingredients well, then add just enough water or milk to bind. The mixture should be stiff. Turn into a greased basin, cover with greased paper, place in boiling water and boil for 2½ hours. Serve with good rich gravy and green vegetables.

Cucumber, Tomato, Onion Salad.

Half pound cucumber, ½ lb. tomatoes, ¼ lb. onions, 1 rounded teaspoon sugar, 3 tablespoons vinegar, salt and pepper, 1 teaspoon chopped parsley. Peel the cucumber and slice thinly. Skin tomatoes and cut across in slices, and peel onion and slice to wafer thinness. Mix together the sugar, vinegar, a level teaspoon of salt and a shake of pepper. Arrange the sliced vegetables in layers in a salad bowl, pouring over the dressing as you go. Leave to stand for 20 minutes, and sprinkle with the parsley just before serving.

Stuffed Cabbage.

One young cabbage, 2 oz. breadcrumbs, 3 oz. grated cheese, 1 shallot, 1 dessertspoon Worcester sauce, salt, little beaten egg. Prepare the stuffing like this: Chop the shallot finely, and fry golden brown in a very little dripping. Place in a basin with the breadcrumbs, grated cheese, sauce and salt, and bind with a little egg. Well wash the cabbage, and with a sharp knife scoop out the hard centre stalk and fill with the stuffing. Tie in muslin and steam till tender. Place on a casserole or au gratin dish and coat with cheese sauce. Brown in a quick oven or under a grill.

Vegetable Pie.

Half ounce dripping, ½ lb. onion, ½ lb. tomatoes, ½ lb. carrots, ½ lb. runner beans, ½ pint boiling water, ½ lb. turnips, 1 lb. peas, or any other vegetables available, salt and pepper.

Green Tomatoes.

Tomatoes need not be ripe to be tasty. Firm and somewhat acid green tomatoes can even bring a touch of novelty to our cooking and should not be despised. They are excellent cut in slices and fried with the breakfast bacon, or served with a joint of mutton or other fat meat. Cut the green tomatoes in halves, sprinkle with a pinch of sugar and salt and bake round the joint.

Squash Pie.

Two cupfuls (breakfast cup) cooked marrow, 2 eggs (separated), 1 cupful brown sugar, ½ teaspoon grated nutmeg, ¼ teaspoon each ground cloves, allspice, cinnamon and salt, 3 cupfuls scalded milk. See that the marrow, after removing peel and seeds, is cut into large dice and well cooked (steaming is best). When tender, drain thoroughly, turn into a basin and add the egg yolks, sugar, salt, nutmeg, ground cloves, allspice and cinnamon. Beat all together. Next pour in the scalded milk and fold in the stiffly beaten egg whites; turn into a deep pie plate lined with a nice short crust pastry. Cook in a hot oven for 10 minutes, then in reduced heat for 25 to 30 minutes.

HANDY HOME HINTS.

Household Accidents.

Many grievous accidents in the home are caused by carelessness, explained afterwards in such statements as: "She slipped on the dustpan lying on the steps," or "Baby must have been able to reach the boiling saucepan." But mostly these accidents need not have happened.

Impose a strict rule not to leave brooms, buckets and the like lying about, but put them away directly when finished work.

The kitchen is a danger-trap, especially round the stove. Don't leave those saucepan handles sticking out at all angles, because children love playing with handles and you may even catch your apron string on them; a full saucepan is an easy thing to tilt, even if it be heavy to lift.

Trailing flex from a standard lamp is another cause for accidents. Run it under the carpet or coil it neatly on a wall hook.

If you move furniture round, don't forget to warn elderly relatives. Bad sight makes them creatures of habit and a low chair where they do not expect to find one may have fatal consequences.

Teaching children to be tidy is almost a life-work. But it must go on and the wise mother will cut out news items about accidents caused by carelessness and read or explain them to the children. Show how scattered toys might be death-traps. Children get real pleasure from packing their toys away tidily if shown how.

A great deal can be done by the housewife to prevent home accidents, if you remember to tidy up as you go along.

Stained Teapots.

The insides of teapots are often very difficult to keep clean of a dark brown stain which is unsightly and may effect the flavour of the tea, in spite of being regularly rinsed through when the teapot is washed. Try this way of removing the stain. Put a little powdered borax into the pot and then fill it up with cold water. Stand the filled pot in a pan of water and bring the whole slowly to the boil. Afterwards, rinse out in the usual way and the stains will have disappeared. Insides of spouts can be cleaned with a small brush. The same treatment is equally good for stained coffee pots.

How to Press a Suit.

There is an art in pressing, and one of the most important tips to remember is to press the steam into the garment. This is done by using a damp cloth and a hot iron. When you lift the iron, steam will be rising from the garment. Take a flat-backed clothes brush and knock it down hard on the part of the garment you have just pressed. Hold it there for a second or two, and then lift and hit sharply again. Continue in this way until not a vestige of steam can be seen.

Now for the pressing process. First, the jacket. Start at the left-hand front of the jacket, pressing from the bottom to the waistline. Move the part you have just pressed away from you, so that it lies, or hangs, flat and is not creased again. Continue right round the bottom part of the jacket. Then press the bust part of the jacket over a pad, then open the revers out flat and press from the underside, knocking the steam in specially well here to give a well-finished appearance. Never press the front of the revers into position; they must be just rolled back into place.

Never show a crease down the sleeve. Place the sleeve near the edge of the table or ironing-board so that the seam edge escapes the iron. Then turn the sleeve gradually round so that the whole area gets properly pressed. The shoulders should be pressed curved round the edge of the ironing-board, or table, or you can use the pad.

Now for the skirt. If your skirt has become baggy at the back, shrink it back to shape like this. Place the back of the skirt on the table and lay a damp cloth over it. Then glide the iron over the cloth in small circles, holding the whole weight of the iron in your hand. The object is to use moisture and heat to shrink the cloth before actually pressing it. When every trace of stretch has gone, press in the ordinary way.

Pleats should be tacked into position before pressing. If any shine appears after pressing lay the damp cloth on again and gently pat with the iron. This will take off the gloss.

QUEENSLAND WEATHER IN MARCH.

Only three districts received over average rains during March, the Upper West and South Coastal districts. Normal amounts were registered in the North Coast, Herbert, and Darling Downs East, with slight deficiencies in the Darling Downs West, Warrego, Upper West, and Lower Carpentaria. All other districts were substantially below normal, while in other better-served areas falls were patchy. Agricultural and pastoral prospects in Southern Queensland should range from average to good, as although there has been a deterioration in rainfall distribution since the end of 1947, the South-West got useful rains in February and the South Coast in March. Much less satisfactory conditions prevail in the tropical half of the State, which failed to receive an inland soaking distribution during the summer months. Some local heavy to flood falls in the first week of March were received north from Lucinda to Babinda and inland to adjacent tablelands, but patchier distribution in the Carpentaria districts has been insufficient, mostly below average. Following the protracted dry spell in many areas in the Lower West and Central Interior eastward to the Central Coast through the adjacent highlands, early soaking falls are required to establish reasonable wintering conditions.

Flooding.—During the first week of March heavy flood falls on the North Coast Herbert and adjacent parts of the North Coast Barron caused suspension of road and rail transport and flooding, particularly in the Cardwell, Tully, Innisfail areas, some of the heaviest 24-hourly falls being 985 Babinda and 734 Cardwell on 2nd, 1,387 Cardwell and 905 Carruchan on the 4th. Lighter amounts over the Burdekin watershed resulted in peak height of 22 ft. 3 in. at Gibson's Farm and 1 ft. 1 in. under the Inkerman Bridge on 8th. Resulting from rains at the end of February streams in the south-west of the State, Cooper's Creek and the Paroo maintained considerable run-off until the middle of the month. In the latter part of the month the cyclone operating off the Queensland coast resulted in flood amounts over the South Coast Moreton between the 22nd and 25th of several 3-in. to 5-in. 24-hourly falls; the heaviest were 539 Springbrook and 467 Burleigh Heads on 22nd, 525 Mapleton and 470 Palmwoods on 23rd. All streams from the Mary River to the southern border were affected, the Mary River reaching a peak height of 30 ft. 9 in. on the 26th.

Temperatures.—Most districts were 1 to 2 degrees above normal for both mean maximum and mean minimum temperatures. Western districts had slightly below average conditions. The south-west was well below normal, mean maximum being 4.5 degrees below and mean minimum 4.3 degrees below. Hottest parts of the State were Winton with a maximum of 104 degrees on the 13th, with 13 days 100 degrees or over, and Richmond, maximum 103 degrees on the 11th and 26th, 19 days being 100 degrees or over. Cooler minimum temperatures at the end of the month in southern districts gave the first frost for the season at Bybera on 30th. Screen minimum 35 degrees, grass minimum 27 degrees.

Brisbane.—Mean pressure $\frac{9 + 3}{2}$ 29.954 in.—Temperatures.—Mean maximum 82.7 degrees (normal 82.2 degrees); mean minimum 67.5 degrees (normal 66 4 degrees); mean temperature 75.1 degrees (normal 74.3 degrees); highest daily 91.5 degrees on 28th; lowest daily 61.7 degrees on 30th.

Rainfall.—613 points on 12 days; average, 571 points on 15 days.

Sunshine.—236.9 hours; average, 215.7 hours.

Rain position is summarised below:—

Division.	Normal Mean.	Mean March, 1948.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	1219	664	46 below
Peninsula South	687	553	20 „
Lower Carpentaria	398	335	16 „
Upper Carpentaria	344	140	58 „
North Coast, Barron	1379	904	34 „
North Coast, Herbert	1390	1387	0 „
Central Coast, East	603	277	54 „
Central Coast, West	345	205	41 „
Central Highlands	279	90	68 „
Central Lowlands	239	150	37 „
Upper Western	197	218	11 above
Lower Western	161	97	40 below
South Coast, Port Curtis	427	452	6 above
South Coast, Moreton	637	683	7 „
Darling Downs, East	277	275	0 below
Darling Downs, West	232	187	19 „
Maranoa	263	160	39 „
Warrego	193	171	11 „
Far South-West	133	37	72 „

Commonwealth of Australia, Meteorological Bureau, Brisbane

ASTRONOMICAL DATA FOR QUEENSLAND.

MAY.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.13	5.17	Cairns	12	46	Longreach	28	42
6	6.16	5.13	Charleville ..	25	29	Quilpie	36	34
11	6.19	5.9	Cloncurry	38	61	Rockhampton ..	2	18
16	6.21	5.6	Cunnamulla ..	30	28	Roma	16	18
21	6.24	5.4	Dirranbandi ..	21	17	Townsville ..	11	38
26	6.27	5.2	Emerald	13	26	Winton	31	50
31	6.29	5.0	Hughenden ..	23	47	Warwick	5	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	p.m.	p.m.
1	11.40	12·57
2	..	1·34
	a.m.	
3	12·35	2 06
4	1·29	2·36
5	2·22	3·05
6	3·16	3·34
7	4·11	4·04
8	5·08	4·36
9	6·08	5.12
10	7 10	5.55
11	8·15	6.44
12	9·21	7.40
13	10 23	8 43
14	11·20	9.50
	p.m.	
15	12·09	10·58
16	12·53	..
		a.m.
17	1·31	12.04
18	2·06	1.08
19	2·39	2.11
20	3·13	3·14
21	3·47	4·16
22	4·25	5.18
23	5·06	6.21
24	5·52	7.23
25	6·43	8.23
26	7·37	9.19
27	8·33	10.08
28	9·30	10.53
29	10·25	11.31
		p.m.
30	11·19	12.05
31	..	12.36

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	26	12	43	27	18	2	50	30
6	19	19	34	35	10	10	39	39
11	10	29	25	44	0	20	27	52
16	14	26	29	42	4	17	33	49
21	23	14	39	29	14	4	45	33
26	30	9	46	24	21	0	53	26
31	24	15	40	31	15	7	46	35

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	46	9	62	36	47	22	38	9
3	43	13	59	39	44	24	36	13
5	33	23	52	45	37	30	27	20
7	22	33	45	54	30	38	19	29
9	12	43	38	59	23	45	11	36
11	5	52	35	65	19	50	5	44
13	3	55	34	67	18	52	4	45
15	11	49	38	63	23	49	10	41
17	21	39	44	57	29	42	18	34
19	27	28	49	49	33	34	23	24
21	39	16	56	41	41	26	33	15
23	48	7	63	35	48	21	40	8
25	55	3	68	32	51	18	45	4
27	54	4	67	33	51	19	44	5
29	48	11	63	38	48	23	40	11
31	40	21	57	44	42	29	33	18

Phases of the Moon.—Last Quarter, May 1st, 2.48 p.m.; New Moon, May 9th, 12.30 p.m.; First Quarter, May 16th, 10.55 a.m.; Full Moon, May 23rd, 10.37 a.m.; Last Quarter, May 31st, 8.43 a.m.

About the middle of the month the Sun will rise and set 20 degrees north of true east and true west respectively, and on the 4th and 19th the Moon will rise and set approximately at true east and true west.

There will be an annular eclipse of the Sun on May 9th, but it will not be visible from Australia.

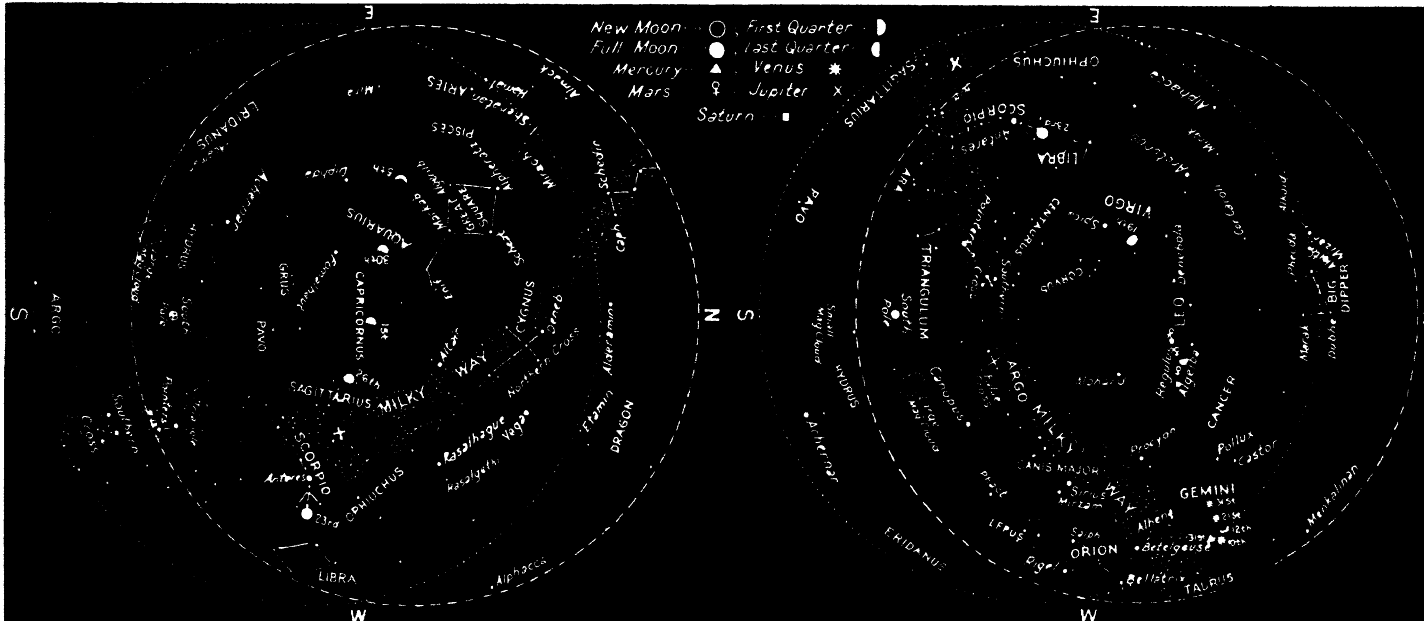
Mercury.—At the beginning of the month will set only a few minutes after the Sun and will reach greatest angle east of the Sun on the 29th, setting 1 hour 30 minutes after the Sun on the 31st.

Venus.—Will set 2½ hours after the Sun at the beginning of May and on the 18th will reach greatest brilliancy. By the end of the month it will set about 2 hours after the Sun.

Mars.—This month, in the constellation of Leo, will set near midnight. On the 15th it will pass 1 degree to the north of Regulus.

Jupiter.—In the constellation of Sagittarius will rise between 8 p.m. and 9 p.m. at the beginning of the month and about 1 hour after sunset at the end of May.

Saturn.—At the beginning of the month, in the constellation of Cancer, will set near midnight, and by the end of the month it will set between 10 p.m. and 11 p.m.



Star Charts.—The chart on the right is for 7 15 p.m. in the south-east corner of Queensland to 8.15 p.m along the Northern Territory border on the 15th May. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 10 hours later. On each chart the dashed circle is the horizon as viewed from Cape York, and the dotted circle is the horizon for places along the New South Wales border. When facing north, hold "N" at the bottom, when facing south, hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown, about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

MARCH.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall. March	Average Rainfall. No. of years' records.	Total Rainfall. March 1947.	Total Rainfall. March 1948.
North Coast.	In.		In.	In.
Atherton	9·08	42	10·89	11·07
Cairns	18·16	61	15·67	12·38
Cardwell	15·77	71	21·98	31·22
Cooktown	15·28	67	12·78	7·99
Herberton	7·98	57	4·83	6·75
Ingham	15·99	51	25·73	11·08
Innisfail	26·81	62	32·44	18·73
Mossman	18·75	19	16·44	12·11
Townsville .. .	7·11	72	11·75	2·29
Central Coast.				
Ayr	6·37	56	19·11	3·89
Bowen	5·74	72	8·51	1·31
Charters Towers ..	3·71	61	3·89	1·74
Mackay	12·09	72	5·57	2 40
Proserpine	12·17	40	10·90	5·92
St. Lawrence ..	5·41	72	5·55	3·05
South Coast.				
Biggenden	3·98	44	11·47	5·52
Bundaberg	5·35	60	9·10	5·09
Brisbane Bureau ..	5·71	96	11·24	6·13
Caboolture	7·83	67	14·62	9·74
Childers	4·84	48	16·66	9·14
Crohamhurst.. ..	11·12	50	17·69	..
Esk	4·72	56	6·51	3·76
South Coast—cont.	In.		In.	In.
Gatton College ..	3·33	44	4·98	..
Gayndah	3·10	72	9·56	3·47
Gympie	6·13	73	9·21	6·37
Kilkivan	3·90	62	9·57	3·43
Maryborough ..	5·90	72	9 39	7·70
Nambour	9·41	47	21·17	14·32
Nanango	3·42	61	6·56	3·94
Rockhampton ..	4·48	72	5·76	4·22
Woodford	7·90	55	9·89	10·38
Central Highlands.				
Clermont	3·16	72	1·91	0·63
Springsure	2·97	74	2·81	1·23
Darling Downs.				
Dalby..	2·74	73	5·14	1·95
Emu Vale	2·47	47	3·83	2·02
Jimbour	2·43	64	7·15	2·11
Miles	2·74	58	3·53	1·12
Stanthorpe	2·59	70	6·08	3·89
Toowoomba	3·78	71	8·48	3·76
Warwick	2·60	78	3·36	3·07
Maranoa.				
Roma	2·72	69	1·93	2·11
St. George	2·15	62	5·88	1·64

CLIMATOLOGICAL DATA FOR MARCH.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature. Mean Max.	Shade Temperature. Mean Min.	Extremes of Shade Temperature. Max.	Date.	Min.	Date.	Rainfall. Total.	Rainfall. Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	88	74	91	12, 14, 23	71	5, 15	1238	18
Herberton	..	80	64	86	15, 24	60	25	675	12
Townsville	..	88	74	93	23, 24	69	27	229	11
Rockhampton	29·91	87	70	93	15, 26, 28, 29	67	20, 31	422	14
Brisbane	29·99	83	67	91	28	62	30	613	12
Darling Downs.									
Dalby	..	85	63	91	28	50	30	195	3
Stanthorpe	..	76	57	86	8	36	29	389	16
Toowoomba	..	78	61	84	8, 27	50	28	376	14
Mid-Interior.									
Georgetown	29·83	93	72	99	25, 26	62	16	215	8
Longreach	29·92	97	66	100	11	58	15	114	8
Mitchell	29·97	84	64	94	9	47	30	105	7
Western.									
Burketown	..	92	74	99	24, 28	66	16, 17	438	9
Boulia	29·87	95	70	101	11	58	30	167	2
Thargomindah	29·95	87	64	94	10, 31	50	30, 31	12	2

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

Volume 66

Part 5

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Edited by
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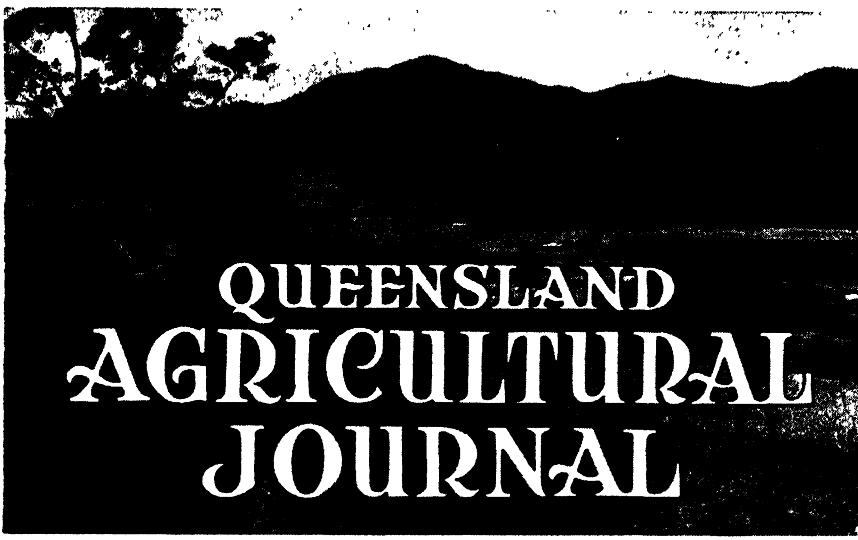
Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Art, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**



Volume 66 | 1 MAY, 1948 | Part 5

Event and Comment.

Beef for Export.

ASSURANCES that the Queensland Government will assist in the further development of the beef cattle industry in every practicable way were given by the Premier, Hon. E. M. Hanlon, at a recent gathering at the Brisbane Abattoir. When prices were high, said the Premier, there was an obligation on those engaged in beef production to use a proportion of their increased returns for the further improvement of the industry.

Mr. Hanlon went on to controvert the view that Australia would have no beef for export by 1960. If that happened, he said, we did not deserve to hold this continent. There were vast tracts of country almost unoccupied and on which nothing had yet been done by human hand. To suggest that was the best we could do with the immensity of the land available was to give expression to a defeatist attitude from which ruination would be the outcome. There were assured outlets for all the meat we could produce. A colossal market could be developed as a result of improved living standards in countries such as India and China. If the teeming millions of Asia and underfed Europe did not get food they could destroy the world. "I hope to hear no more of this talk of there being no beef for export," Mr. Hanlon added.

Continuing, the Premier remarked that the findings of the Abattoir Commission, confirmed by the Bureau of Industry and backed up by informed people, indicated that there were immense possibilities for increasing the output of the Cooper Channel region and the fattening areas between Clermont and Charters Towers. The great Burdekin dam would provide water for hundreds of thousands of acres of irrigated pastures for cattle fattening. The Queensland Government held the view that the beef cattle industry was of the greatest importance, and would do whatever was necessary to improve the cattle breeding and fattening country, so that by 1960 they would be all laughing at the crazy theory that there would be no more beef for export.

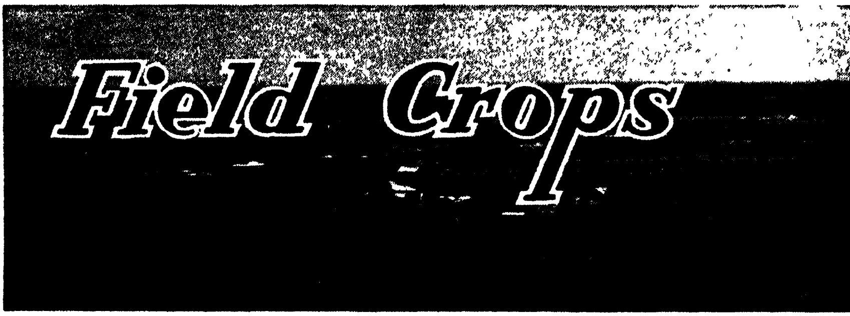
The Film and the Farmer.

WE have had an opportunity of seeing something of the activities of the Mobile Film Unit of the Department of Agriculture in Victoria, which is an integral part of its field organisation. All the work, including scenario writing, direction and technical production, is done by the personnel of the unit and pictures already made and in circulation compare favourably with commercial films in respect of subject, presentation, technical accuracy, photography, and general treatment.

The farmer to-day is more than ever willing to accept and apply the principles of agricultural science. His business acumen impels him, but, what is more important, science is not being rammed down his throat; and he knows that the results of research are put through the test of practical farming before they are recommended for his adoption. There is a marked desire to know the how, the why, and the wherefore of things and, without going into his paddock, there is nothing better in the way of imparting advice and instruction than showing the farmer a good picture illustrative of the information it is desired to convey. Obviously, the film has a big future in this technical advisory field. For example, take the picture "The Science of Milk Production," and its supporting feature "Dairying in Other Lands," now going the rounds in our dairying districts. To see such films is to appreciate the value of this form of visual education.

Moreover, nothing can equal a well-produced and technically accurate presentation of a farming subject for making people generally —people of our towns and cities who, perhaps, know little of country life and industry beyond what may be seen from a motor-car in a rapid run along a bitumen road—aware of their close and vital relationship to the primary producer. Films of our land and water resources, of farming practices and manufacturing processes in respect of primary products, and of social aspects of food and agriculture—all convey lessons which should not be lost on city dwellers and workers in urban industries. To farmers particularly, pictures showing correct land use, new cultural methods with modern machinery, applied principles of soil and water conservation and practical forestry are invaluable. On the screen we have seen how, in older lands, soil worked for a thousand years and more and nursed and nourished by generations of farmers is to-day giving a better product for less labour than in any period of its history. That is what tradition means to farming.

The film may teach us, too, how the food-giving value of the soil depends on care and intelligence and the efficiency of the means by which it is preserved.



A Soil Erosion Control Experiment in the Isis District.*

L. G. VALLANCE.

Introduction.

A SERIOUS problem in the utilization of hill sides for sugar cane culture is the gradual decline in production brought about by the downhill migration of surface soil. In the Isis area there is abundant evidence of considerable deterioration in soil fertility on the steeper slopes of many of the hillside farms which are typical of this district. Some of these slopes have been so affected by erosion that the point is now being reached beyond which they can no longer be profitably planted to cane. Fortunately, however, only a few small marginal areas have, as yet, reached this stage, and even on these it would appear that the wartime scarcity of fertilizer has also contributed to their abandonment. In general, the amount of damage which has already been done is revealed by the poor growth of cane on the upper portions of the slopes as compared with the much more vigorous growth at the bottom. Plates 95 and 96 show a typical eroded hillside in the vicinity of Childers, which is the business centre of the Isis district. In the middle distance (Plate 95) is a slope of 10 to 16 per cent. gradient which has been considerably affected by "sheet" and "finger" erosion. The block of cane (Plate 96) immediately joins this on the right. The upper portion of this block shows the thin stand of cane characteristic of washed soils. The light patches above this indicate the exposed subsoil.

Climate and Soils of the District.

Rainfall figures recorded at Childers are given in the table below, and these indicate a well marked seasonal distribution, with a summer

RAINFALL DATA FOR CHILDERS.

—	Years.	Jan.	Feb.	Mar.	Apr.	May	J'ne	July	Aug.	Sep.	Oct.	Nov	Dec.	Annual.
Rainfall (points)	43	727	669	465	282	207	245	170	119	179	276	274	571	4,184
No. Wet Days	43	10	11	11	9	7	7	6	4	4	6	7	11	—

* Paper presented at the Bundaberg Conference, Q.S.S.C.T., April, 1946, and reprinted from *The Queensland Cane Growers' Quarterly* (Bur. Sug. Expt. Stns., Dept. Ag. & Stock, Q.), Jan., 1947.

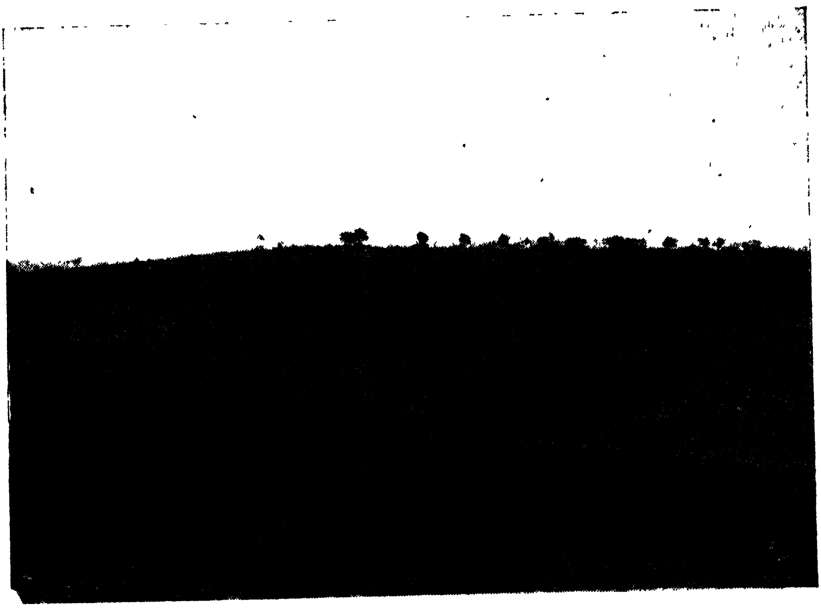


Plate 95.

Plate 96.

GENERAL VIEW OF TYPICAL ERODED HILLSIDE AREA.—Showing fallow land affected by finger erosion and patchy stand of cane on eroded slope.

maximum. The average precipitation per rainy day is also highest in the summer months, rising to a maximum of 0·73 inches in January. Unfortunately no detailed information is available regarding the intensity of the rainfall. However, local experience indicates that late spring and early summer storms of three to four inches per hour are not uncommon. Since harvesting is usually completed by the end of December and most of the land is being prepared for January-February planting, the soil is particularly susceptible to erosion at this period.

The soils of the district are for the most part deep, red basaltic loams. There is no sharp line of demarcation between the surface and subsoil, but a gradual transition occurs and the clay content increases with depth. The depth of surface soil varies considerably with the topography, and ranges from four to six inches on non-eroded hillsides, and from ten to fifteen inches on the flat country. The colour is usually dark red-brown or chocolate. The texture is best described as loam. It is underlain by a clay loam or light clay subsoil which is lighter red-brown in colour. This also varies in depth with the topography and may be two to four feet deep on hillsides and eight to twelve feet deep on the lower lying areas.

These soils, under virgin conditions, were highly fertile scrub soils. They were well supplied with humus and in consequence these highly ferruginuous soils possessed a very favourable crumb structure. In addition to their excellent physical condition they were initially well supplied with mineral plant-foods. The attraction of such fertile soils proved irresistible to the early settlers and even the steepest slopes were brought into cultivation. These hillsides have now been under continuous cropping to cane for a period of some 50 to 60 years. During this time much of the organic matter has disappeared and this, together with the constant mechanical effect of cultivating implements, has resulted in a marked depreciation of the original favourable structure. In consequence the soil is now less absorbent of moisture and more readily puddled. The soil immediately below plough depth has become pounded down and much of its permeability has been lost. Such conditions greatly increase erodibility and an accelerated rate of erosion is inevitable under the present methods of cultivation.

The Objective and Design of the Experiment.

The problem, therefore, is to arrest this loss of surface soil in order to prevent further decline in productivity on land which can still be profitably planted. To do this there are several factors to be considered. Firstly, there is the restriction imposed by the assignment system which allows the grower very little opportunity to rest his land under soil-rejuvenating cover-crops in order to restore humus, and thus maintain a satisfactory physical condition. Fortunately, however, the nature of the growth of the cane plant itself is such that it assists in many ways in the prevention of erosion. For instance, because of its ratooning habit it is not necessary for the soil to be brought frequently to a fine tilth, as is the case with crops that are planted annually. Again, the cane rapidly covers in and forms a dense leaf canopy which protects the soil from the full force of torrential downpours. The large number of stalks per stool has a definite filtering effect which impedes and reduces the velocity of run-off water. On the debit side, however, is the fact that, because of the late summer planting of the variety P.O.J. 2878, the soil is usually least protected and most vulnerable during the dangerous period of summer storms.

Furthermore, any system of erosion control must be so designed as not to interfere with cultivation and harvesting methods to such an extent that the cost of production is prohibitively increased. Therefore any terraces, channels, and drainways constructed must be of such a type as to allow unrestricted movement of the fairly heavy mechanical equipment now in general use throughout the district. Consideration must be given to harvesting requirements, particularly as regards the use of portable tramlines.

The Site.

An area of approximately seven acres, located about one mile from Childers, was generously made available for experimental purposes by one of the leading growers of the district. This had been cultivated to cane for approximately 40 years. No rotation to other crops had been practised, with the exception of a few cover-crops grown for two to three months between harvesting and the next planting. The slope is typical of the steeper hillside country, having a maximum gradient of 16 per cent. Some "sheet" and "finger" erosion has affected the area but, given satisfactory weather conditions and adequate fertilization, the land is still capable of producing reasonably satisfactory crops of

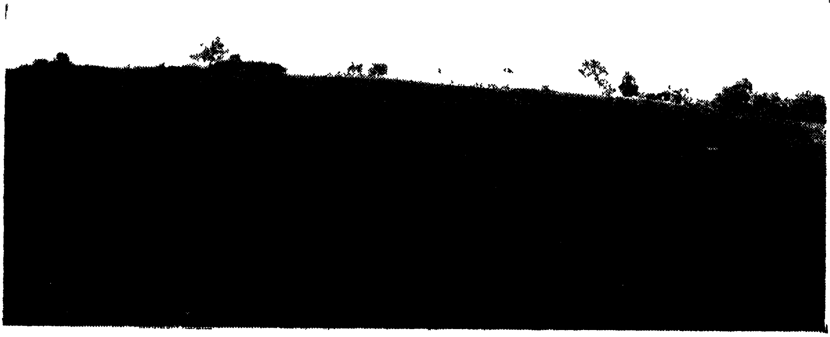


Plate 97.

SHOWING GENERAL LAYOUT OF EXPERIMENT.

cane. The soil is a red basaltic loam and may be regarded as fairly representative. A portion of the area covering approximately four and one-quarter acres is bounded by two natural gullies or waterways. On this a series of broad, shallow ditches following the contour and about 50 feet apart have been constructed. When planted the cane rows will run parallel to these. The remaining two and three-quarter acres is to be used for comparison and will be planted in the manner normally used in the district, i.e., the cane rows will be off level and may have gradients varying from 5 to 10 per cent. Soil samples from the area have been submitted to analysis, as a result of which the land was given a dressing of lime at the rate of one ton per acre and will be fertilized at planting with Sugar Bureau Mixture No. 3 (1·75-10-25) at the rate of 400 lb. per acre.

The Nichols Terrace.

The basic design of the experiment is the series of broad, shallow ditches following the contour (Plate 97). These are flanked on the downhill side by a mound or ridge of earth. The complete unit, i.e., ditch plus mound, is referred to as a "terrace." Eight of these terraces were constructed, all of which lead into a main outlet channel running down the eastern and northern boundaries of the field. The sketch plan given in Plate 89 shows the layout of the terraces in relation to the outlet channel. The function of the terrace is, of course, to divert run-off water into the outlet before it has obtained sufficient velocity to erode the loose surface soil from the cultivated area between terraces. No. 1 terrace occupies the higher portion of the field and there is a vertical drop of approximately 50 feet from No. 1 to No. 8. In order to ensure that the water would move along the terrace channel and so pass into the outlet channel the terraces were given a slight fall as shown in the following table:—

FALL PER 100 FEET OF TERRACE.

0-100	feet	of	terrace—nil	grade
100-200	„		„ —1½in.	„
200-300	„		„ —2in.	„
300-400	„		„ —2½in.	„
400-500	„		„ —3in.	„

This slight gradient is sufficient to prevent water building up and finally overtopping the terrace but is not great enough to permit rapid movement and consequent scouring in the channel itself.

The type of terrace constructed was primarily of the Nichols type rather than the broad-based Mangum terrace. In explanation of the essential difference between the two types it may be pointed out that the Mangum is fundamentally a broad mound of soil resting on the original soil surface. It is built up by throwing the soil inwards from both sides. There is no definite waterway on the uphill side and the mound itself is depended upon to hold and divert the water along the contour. In the Nichols terrace a broad, shallow channel is cut and all the soil removed therefrom is thrown *downhill* to form the mound. This ensures that the maximum amount of water is carried in the channel. This channel is, of course, below the original soil surface, and should the flanking mound break during heavy rainfall the channel itself still drains away a considerable volume of water. Because of this, the Nichols type of terrace is particularly suitable for areas subject to rainfall of high intensity. The construction of the terraces was carried out with a No. 11 speed patrol road grader. This is a heavy unit of eight tons in weight, with a 60 horsepower Diesel motor and a twelve-foot blade. Some scoop and shovel work was necessary at the ends of terraces, particularly at the junction with the main outlet channel.

The completed terrace is shown in Plate 99. The area of cross-section of the waterway averages approximately three square feet. Whether this is sufficient under the prevailing conditions of run-off and rainfall remains to be seen. Indeed one of the main objectives of this present experiment is to determine the carrying capacity required. It may also be pointed out that, in this work, because of the steep slope, the mound itself is relied upon to provide most of the carrying capacity.

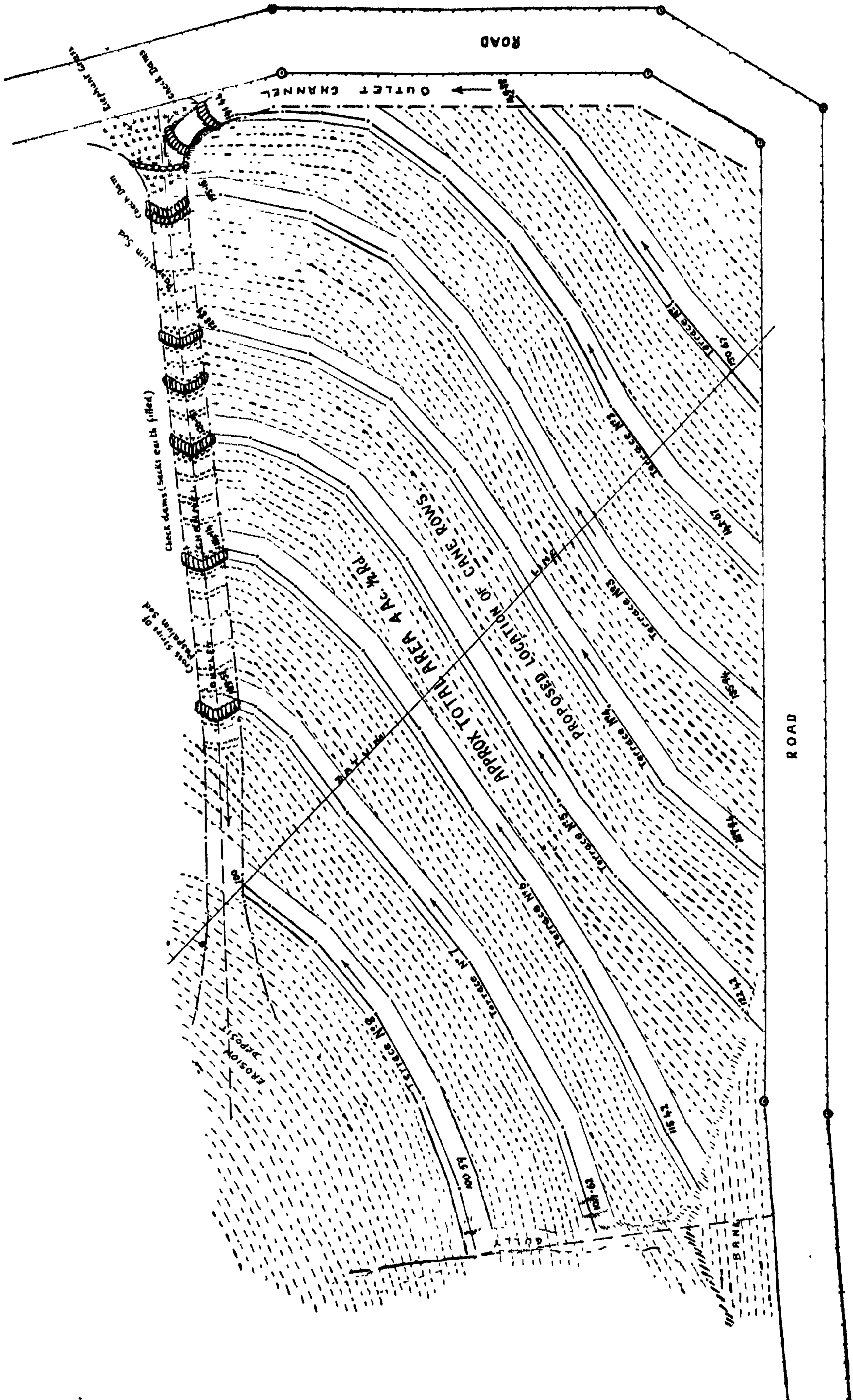


Plate 98.
SKETCX PLAN OF TERRACED AREA.

This is not ideal but is inevitable on slopes of such steep gradient as 16 per cent. On a lesser slope, say five per cent., the carrying capacity of the channel itself would be much greater and practically all the water would be carried in the channel, which is the true function of the Nichols terrace. However, the high degree of slope of this piece of land is probably the maximum with which it will be necessary to deal, and should these experimental terraces prove satisfactory on this field it is felt that they may be constructed with reasonable confidence on the slopes of eight to ten per cent. which are more typical of the district.

The Vertical Interval and Distance between Terraces.

It should be pointed out that because of lack of data on the rate of water movement through these porous red soils the experiment under discussion must be regarded as being purely exploratory. In deciding upon the distance required between terraces there are many factors which must be taken into account. The maximum distance must not

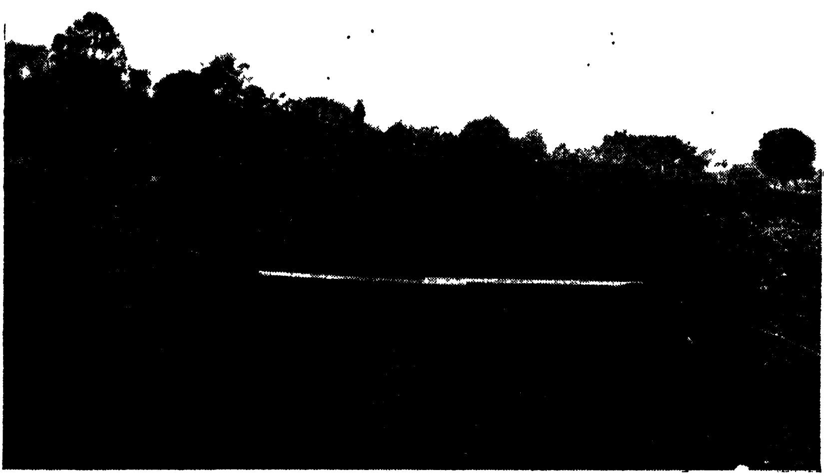


Plate 99.

THE FINISHED TERRACE.—The staff is nine feet long and is perfectly horizontal. The greatest depth is ten inches.

be greater than is consistent with safety and the minimum distance must be fixed with due regard to the economic and cultural aspect. The terraces were therefore constructed so as to average not less than approximately 50 feet apart on the steepest portions of the field, i.e., the equivalent of about 11 rows of cane at 4½ feet intervals. As each terrace, i.e., the channel plus mound, occupies approximately 18 feet which will not be planted to cane, it is apparent that the terracing of land at the above intervals results in the loss of three rows in every 11 rows of cane. This loss of over 25 per cent. of production acreage is admittedly important. However, in the interests of safety in the light of overseas work it was considered inadvisable to increase the distance in this particular trial.

In fixing the location of the terraces, therefore, a straight line was taken downhill so as to traverse as far as was possible the steepest part of the slope. Fifty feet intervals were then marked off at which the

terraces would intersect this line. The levels taken at these points gave the vertical interval or drop between adjacent terraces. These, when re-checked after the completion of terracing, gave the vertical intervals as shown in the following table:—

VERTICAL INTERVALS BETWEEN TERRACES.

Between Terrace	No. 1	and	No. 2	=	8·0	feet.
" "	" 2	"	" 3	=	6·7	"
" "	" 3	"	" 4	=	6·5	"
" "	" 4	"	" 5	=	7·0	"
" "	" 5	"	" 6	=	7·0	"
" "	" 6	"	" 7	=	7·8	"
" "	" 7	"	" 8	=	7·0	"

As minor variations in slope occurred throughout the field there were, of course, variations in the distance between terraces. However, in general they are 55 feet apart with a minimum of approximately 40 feet and maximum of 70 feet. It is expected that systematic

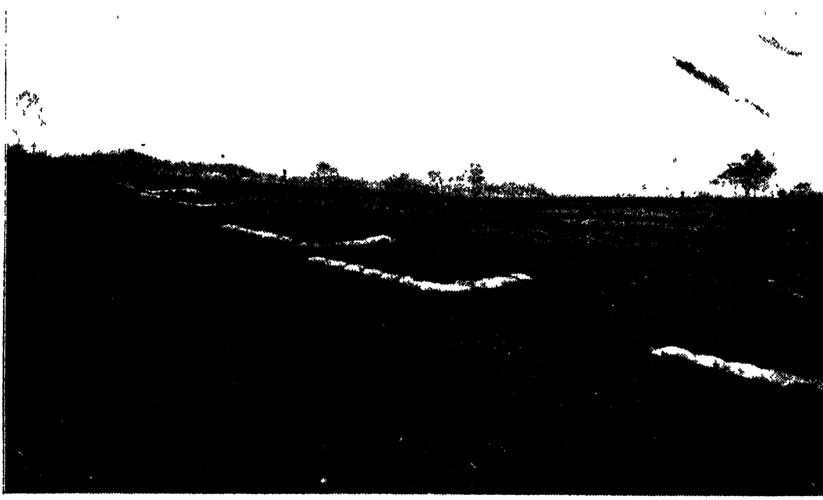


Plate 100.

SHOWING CHECK DAMS FOR STABILISATION OF MAIN OUTLET CHANNEL (UPHILL VIEW).

observations on the behaviour of the terraces with the above horizontal and vertical intervals will provide valuable information from which practical recommendations may be evolved for general application to the district as a whole.

The Main Outlet Channel.

Because of the restricted area available the terraces were of limited length, varying from 200 to 430 feet. It was therefore decided to carry the run-off water along the complete length of the terrace, i.e., from one side of the field to the other. This was done in order to obtain all possible information regarding the behaviour of the water in the

channels. Therefore all the run-off from the field is diverted by means of the terraces into one main outlet channel. As it might reasonably be expected that during heavy rainfall a considerable body of water would be moving down this outlet drain, it was necessary that the drain should be adequately protected. If this were not done, rapid gully erosion might occur in the outlet channel resulting in a considerable increase in depth. Immediately this took place the terrace channels themselves would start to cut back from the point where the water spills over into the deeper outlet. This is fatal in any erosion control system, the field ultimately becoming dissected by a series of uncontrollable canyons. Therefore it must be realised that the formation of the outlet channel is exceedingly important and experience has shown that very often the success of the whole scheme depends upon the satisfactory functioning of the main outlet. The channel constructed was in the form of a broad ditch some 16 feet wide with a shallow V bottom. The gradient of this varied from about 14 per cent. over the first 150 feet to about 10 per cent. at 150 to 300 feet, gradually decreasing till at approximately 900 feet it ran into a wide valley built up with erosion-deposited material. This latter area will be planted with cane which will receive the run-off water in such a greatly dispersed condition that no trouble is envisaged regarding its disposal, particularly in view of the permeable nature of this deep built-up soil.

In soil erosion control work it is now generally recognized practice to form the main outlet channel about twelve months before the channels are constructed. This enables it to be planted with grass or other soil-holding plants in order that it may become well sodded and protected before any water is diverted into it. This precaution, however, was not possible in the present experiment without delaying the scheme for an appreciable period. In view of the exploratory nature of the trial, it was decided to protect this drainway by artificial methods. At the end of each terrace a check dam was constructed across the main outlet by placing fertilizer bags (160 lb. bags) filled with soil in arrow formation pointing down hill (Plates 100 and 101). The location of these in relation to the terraces and also that of some intermediate dams are shown in Plate 98. The bags were let into the soil to prevent movement and undercutting. Paspalum sods were planted beneath the uphill edges. Between each check dam a double row of these sods was also planted right across the outlet, at intervals of six to eight feet. These were watered in to ensure a sucessful strike. A small vulnerable point above the bend of the channel, which received run-off water from a road, was planted with elephant grass and also bolstered with a check dam (Plate 102).

Cultivation of the Area and Maintenance.

It should always be remembered that the construction of terraces alone should not be relied upon completely to control soil-washing in cultivated areas. Contoured cultivation is also necessary, and, in the case of sugar cane, the fact that the planting rows may conveniently be run on the contour is of considerable value in reducing run-off. In this experiment, the cane will be planted parallel to the terraces, the first row in each inter-terrace area being along the downhill margin of the bank of the terrace immediately above. Since the slope is not uniform the width of the strip between any two terraces varies throughout the length, and in consequence, therefore, some short rows are unavoidable on the lower side. In order to avoid damage to the terrace channels

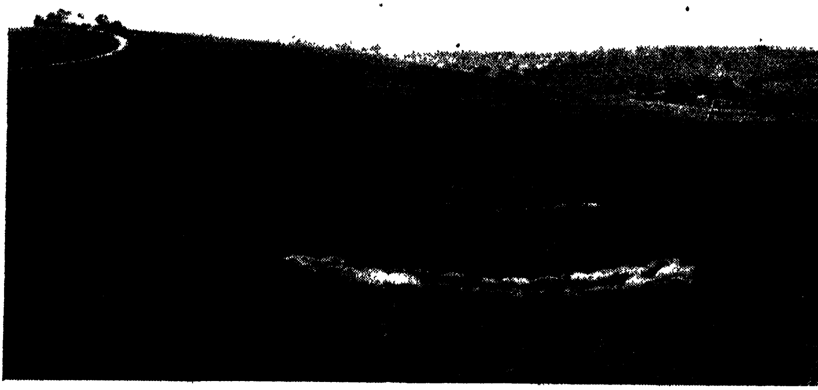


Plate 101.
DOWNHILL VIEW OF CHECK DAMS IN MAIN OUTLET CHANNEL.

and mounds, it has been decided that cane will not be planted within nine feet of the centre of any channel. As previously pointed out, this will result in the loss of about three rows of cane in eleven. This is undesirable, but necessary in order to determine the stability and required carrying capacity of this type of terrace. Actually, because of the broad, shallow nature of channel and mound, it would be possible to plant cane, as far as soil suitability is concerned, to within about 4½ feet of the centre of the channel. This would mean that only one row of cane would be eliminated. Sufficient information may be available at the time of ratooning to warrant an experimental planting of the two additional rows.

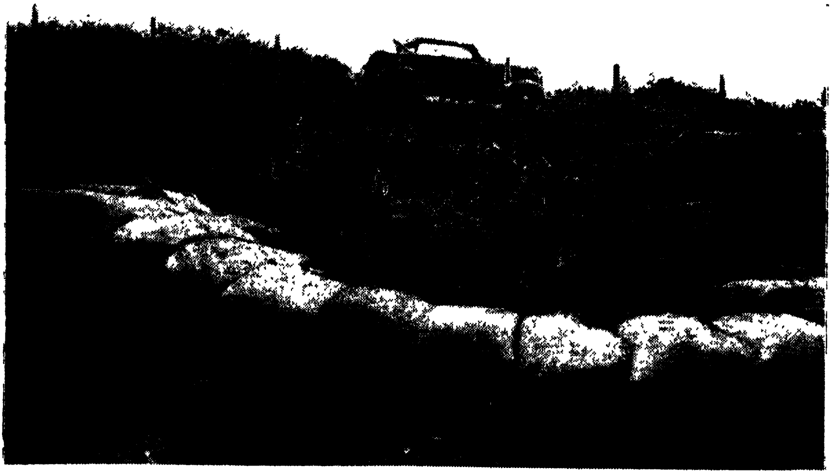


Plate 102.
PROTECTION, BY MEANS OF ELEPHANT GRASS AND CHECK DAM, OF VULNERABLE POINT WHERE MAIN OUTLET CHANNEL CHANGES DIRECTION.

Because of the exploratory nature of the trial, no information is yet available on the amount of maintenance that will be required on terraces set out in this particular type of soil. Since it will presumably be necessary to control weed-growth on channels and mounds, the use of some type of scraper weeder is envisaged. It is considered possible that a blade mounted on a scarifier frame may be adapted to destroy weeds and at the same time carry out any reshaping that may be necessary.

TRENCH SILAGE.

The making of trench silage is a satisfactory method of conserving fodder for drought reserves when it is to be kept for periods of a year or more. Next to stacking, ensiling in trenches requires the least capital outlay. Once built in a suitable situation, trenches are long lasting, and although not quite as satisfactory as tower silos, their use is an excellent way of becoming familiar with the making and feeding of silage.

For preference a high spot, where there is no danger of seepage or of underground water lying, should be selected. Such a site can be found on nearly every farm. Avoid the heads of gullies and other depressions. The top of a ridge or spur is a particularly good site, especially if drainage can be obtained from the pit at one end. Good drainage (so that water will not run into the pit) is the main consideration. If this is available pits may be successfully constructed on flat country, but the site should not be subject to flooding.

In inland districts any red soil will be suitable. In general, clay soils are to be avoided as they tend to crack and allow the entrance of air at the sides of the silo.

When sheep are to be fed from the pit, it is an advantage to have fit as close as practicable to the crop, to reduce the expense of cutting and carrying; but on the dairy farm a position in proximity to the bails has more to commend it, as ease of feeding is an important consideration.

Size of Trench.

The present tendency is towards the making of small pits of 35 to 40 tons capacity. Extra capacity is obtained preferably by lengthening the pit rather than making it wider or deeper. This facilitates filling and covering, and there is less shrinkage. In addition, cutting on the small face exposed in a long pit leaves less material exposed to the air. This is an advantage if a trench is opened, but not completely emptied, at any time.

A pit to hold 35 tons should be 50 feet long at the top, 20 feet long at the bottom, and 5 to 6 feet deep. It should taper from 9 feet wide at the top to 8 feet wide at the bottom. A trench 80 fet long by 14 feet wide, 4 feet deep, holds 70 tons. It is geenrally better, however, to have two small trenches rather than one big one, as filling and feeding out are facilitated.

The walls should be smoothly finished with a slight batter, to allow free settling and ensure a constant downward pressure of the silage on the walls. By this means there is efficient exclusion of air, and mould growth along the walls is prevented.

An effective type of pit can be made on the side of a slope with a gradient of about 1 in 10, the end of the trench on the up-side of the slope being given a batter of 1 in 3. The other end is allowed to run out to ground level on the down-side of the slope, this permitting of effective drainage and ease of filling.

The smallest satisfactory size of pit is about 20 tons capacity, while the largest should not exceed 70 tons. In excavating, it is safe to estimate the silage capacity of a pit, as at the rate of 1 ton of silage for each 2 cubic yards excavated below ground level. A good crop of wheat or oats will cut between 4 and 5 tons of silage to the acre, while on the coast Japanese millet will cut about 8 to 10 tons, and maize between 12 and 25 tons to the acre. Usually the yield of silage from a maize crop would lie between 15 and 20 tons, and the yield from Saccaline sorghum is generally a little lighter.

PLANT PROTECTION

Black Rot ("Rust") on Cabbages and Cauliflowers.

J. E. C. ABERDEEN, Pathologist, Science Branch.

BLACK rot has caused very severe losses in early cauliflowers this year. Many growers are not aware of the cause of this disease or the control measures that may be taken to reduce losses, and so the following notes are published for their information and future use.

The disease may occur on either cabbages or cauliflowers. The name black rot by which it is known throughout the world is in some ways misleading to the grower, because the most obvious symptom is the occurrence of yellow-brown areas around the edges of the older leaves. These leaves later fall off, but similar diseased areas will appear progressively on the younger leaves as the disease advances. This appearance has lead to the disease being known as "rust" to some farmers. On further development, if the diseased leaf is broken dark strands will be seen in the main vein of the leaf, and later still, similar black stands appear in the main stem. A striking fact about this disease is the rapidity of spread after a spell of rainy weather. So striking is this that the rain is often regarded as being the cause of the disease.

The true facts in the development of this disease are that it is caused by particular bacteria whose growth and multiplication is favoured by very warm weather. In addition, to enable it to spread, it must have abundant moisture, preferably wind-blown showers. The period of the year when these conditions are best fulfilled is from late January to the end of March, so the main epidemics are amongst the "early" cauliflowers and cabbages.

The more obvious symptoms as described above do not become common until the wind and rain commence transferring the bacteria from one plant to another. The disease first enters the crop either through the seed or from the soil. In the case of the soil, the carryover is considered to be principally in the cabbage and cauliflower trash that is rotting in the soil, and possibly in the soil itself.

In considering the aspect of infection from the soil, attention should be focussed on the seed-bed, as conditions favourable for spread of the disease are more likely to occur there than in the field and there is a very large concentration of plants in a small area. It is estimated that it takes two to three weeks from the time of infection before any definite symptoms appear on an infected leaf. Consequently the disease would rarely be seen in the seed-bed even if the spread had been active in that period of the plant's growth.

Control.

Spraying of the crop in the field is unsatisfactory, so control measures are confined to (1) treating the seed, (2) ensuring a disease-free seed-bed. The evidence this year strongly suggests an original seed infection, so seed treatment is particularly emphasised.

The most successful treatment is to immerse the seed in water at a temperature of 122 deg. F. for thirty minutes. Disinfection with corrosive sublimate using a strength of 1–1,000 for thirty minutes may also be used, but this method is not considered quite so effective as the hot-water treatment.

In selecting areas for seed-beds most growers take such precautions as using land where cabbages or cauliflowers have not grown before, but it seems that more definite steps must be taken and the seed-bed actually treated by either fire or formalin, and then reasonable precautions taken not to introduce untreated soil into the beds on rakes and other implements. Details of these methods of treatment are readily obtainable from the Department if required.

FODDER CONSERVATION.

Some useful and interesting information on the amount of labour involved and the cost of constructing and filling a trench silo on his property has been supplied by Mr. A. Cockerill of Mulgeldie.

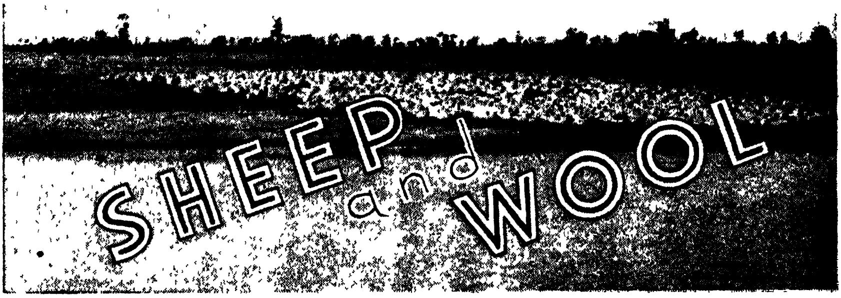
Mr. Cockerill writes that he had the trench made by contract with modern earth-moving equipment at a cost of £22 10s. The dimensions at the top are 110 feet long by 12 feet wide, and at the bottom 38 feet long by 10 feet wide. The depth is 8 feet. A calculation shows that the capacity of this trench at ground level is 120½ tons; but Mr. Cockerill has filled it higher than this and has consolidated the ensilage with a tractor, so that he should have an actual tonnage greater than this.

To fill the trench, Mr. Cockerill grew 10 acres of saccaline. The land had two ploughings and harrowings, and the seed was sown with a combine at 10 lb. to the acre. The corp was cut with a tractor-mower when 10 feet high. It took 280 man-hours to fill the trench, 15 hours to place 15 loads of grass over the saccaline, and another 40 hours to scoop a good layer of soil over the whole lot. The crop was carted to the trench with a ton truck. The total mileage was 162 miles.

Costs are set out by Mr. Cockerill as follows:—

	£	s.	d.
Construction of trench	22	10	0
Ploughing and harrowing twice at £1 per acre each time	20	0	0
Seed and sowing	4	1	6
Cartage, 162 miles at 8d per mile	5	8	0
Labour, 350 hours at 2s. per hour	35	10	0
Mowing, 10s. per acre	5	0	0
	£91	19	6

He has therefore laid down at least 120 tons of ensilage at a reliably estimated cost of about 15s. per ton. Mr. Cockerill estimates the value of the silage at £2 per ton, but his neighbours variously value it at £4 to £8 a ton. The point of interest, however, apart from the value, is that he has insured himself against loss of his herd in any future dry season.



Fertility and Infertility of Sheep.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

INTRODUCTION.

STRICTLY speaking, fertility refers to the capacity of any species of animal to reproduce. Infertility infers that the animals are incapable of producing offspring. In the sheep areas of pastoral Queensland, however, the use of these words has been corrupted and the level of the fertility in a flock is often gauged by the percentage of lambs marked to ewes mated. This is really a crude measure of the flock's reproductive rate in a particular year.

In this article, many factors influencing the reproductive rate of sheep, besides fertility and infertility of ewes and rams, are discussed. The importance of a high reproductive rate in flocks cannot be over-emphasised. The average useful life of a sheep is not long, and accordingly every breeding flock must replace itself completely in about five years. Droughts have taken heavy tolls of the sheep population in Queensland. On more than one occasion, woolgrowers have been called upon to rebuild their flocks. Under these circumstances a high rate of reproduction is essential.

The gross rate of reproduction in a flock is governed by (1) the number of seasons during which the ewes are mated; (2) the yearly death rate of breeding ewes; and (3) the percentage of ewe lambs marked to ewes mated.

A more correct measure of the reproductive rate considers the replacement of breeding ewes; that is, cognizance must be taken of the proportion of losses amongst ewe lambs before they reach sexual maturity. This is sometimes referred to as the net reproductive rate, and it influences the rapidity with which flocks can be rebuilt after severe drought losses, the age at which ewes may be cast and the degree of selection which might be practised amongst young ewes.

Recognised methods of good sheep husbandry necessitate the regular and systematic "culling" of the young sheep in order that any animals which do not conform to reasonable standards of breed type, or which are likely to be indifferent wool producers, might be removed from the flock. Because of a low reproductive rate amongst their flocks many wool-growers, particularly those in north-western Queensland, are unable, in a large number of years, to cull their sheep. This in itself may hinder an improvement in the efficiency with which wool is produced.

THE FERTILITY OF EWES.

The Process of Reproduction.

The main organs of reproduction in any female animal are the uterus (the womb or breeding bag) and the ovaries. In ewes the ovaries are small bodies each about the size of a large green pea. The uterus is a small muscular bag capable of great expansion and is shaped somewhat like a pair of riding trousers. It has a body and two fairly long horns. From these, fine tubes, known as the Fallopian tubes, lead towards the ovaries on their respective sides. The Fallopian tubes are not connected to the ovaries but terminate in a small funnel just near them. The body of the uterus is contracted into a narrow neck, known as the cervix, just where it joins on to the upper end of the vagina, which is commonly known as the "breeding passage."

The ovaries are important because they form a minute egg, known as the ovum. This has the capacity, under certain circumstances, of developing in the uterus into a new individual. The ovary is also responsible for the elaboration of hormones, which circulate in the blood. These play an important part in the maintenance of pregnancy and in the development of the characters associated generally with femininity of ewes.

Changes take place in the ovary and these are bound up with the formation and liberation of the ovum. When liberation occurs, the shed ovum finds its way slowly down the Fallopian tube into the uterus, which it reaches in about 70 hours. At about this time the ewe experiences a period of sexual desire known as oestrus or heat and she will permit service. In most cases oestrus lasts for about 24 hours, though there is some variation. The ovum is shed towards the end of oestrus. During service the ram deposits semen in the upper end of the vagina and near the cervix.

The semen consists of a very large number of minute organisms, known as sperm, suspended in a special fluid secreted by some of the glands associated with the reproductive organs. The sperm swim through the narrow opening in the neck of the uterus and continue on until they reach the tip of the horns within about five hours after being deposited in the breeding passage. They then ascend the Fallopian tubes. The first sperm to meet with the ovum fuses with it, and at this stage fertilization is said to have taken place. It is from the fertilized ovum that the new lamb develops. If two ova are shed at one time and both are fertilized the ewe has twins. Fertilization usually takes place when the ovum is about two-thirds of the way down the Fallopian tube. After fertilization the ovum develops a thickened coat about itself and in most cases this prevents other sperm from entering. The fertilized ovum moves down the remaining portion of the Fallopian tube and enters the uterus. Fertilization is followed by a period of rapid cell division and before long the ovum attaches itself to the lining of the uterus. As development takes place a set of membranes, known to most stockmen as the "water-bag," is formed. The membranes perform a number of functions, which include establishing close contact with the lining of the uterus, thereby ensuring that the embryo is well fed. They also secrete a hormone which has an important bearing on pregnancy and affords a certain amount of protection to the developing young.

It is usually stated that the gestation period for ewes (that is, the time from fertilization of the ovum until birth of the lamb) is five months. Actually it varies from about 142 days to 152 days.

During the last two months of gestation the lamb develops rapidly. At this time the nutritive requirements of the ewes increase proportionately. In the event of the ewes being on poor pastures, they draw on the stores of calcium, protein, and vitamin A which are laid down in their body tissues. In times of stress the requirements of the lamb take preference over those of the mother. Changes take place in the

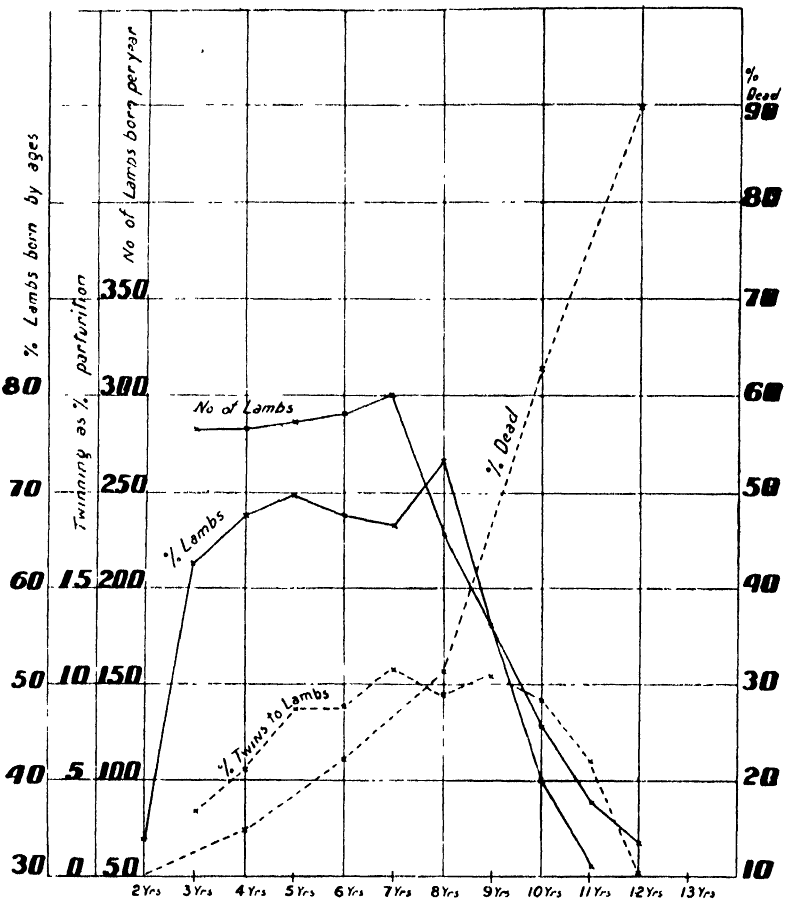


Plate 103.

SHOWING THE RELATIONSHIP BETWEEN FERTILITY, TWINNING, MORTALITY AND AGE.

[*Graph by Dr. R. B. Kelley.*

mammary glands or udder, which commences to produce milk. Finally, when gestation is complete the contact between the membranes and the lining of the uterus breaks down. The uterus contracts and, aided by the powerful seizures of the abdominal muscles, the lamb is born.

In the event of fertilization not taking place and/or normal pregnancy not occurring, the ovum does not attach itself to the lining of the uterus and it is finally voided. Under these circumstances, further changes take place in the ovaries and a new ovum is subsequently shed within from about 16 to 19 days. These cyclical changes are referred to as the oestrus cycle and their occurrence has an important bearing on fertility of sheep and on flock management.

Female Aspects of Fertility.

A large number of factors influence the reproductive capacity of ewes. These include breed, age, and environmental conditions. Permanent infertility due to disease is not generally common amongst ewes.

It is well known that English sheep are much more fecund than Merinos. Twinning is more common in Romney Marsh and Border Leicesters than in Merinos, and in addition ewes of the English breeds are reported to have a longer breeding life, and being bigger they probably do not suffer so much trouble at lambing time.

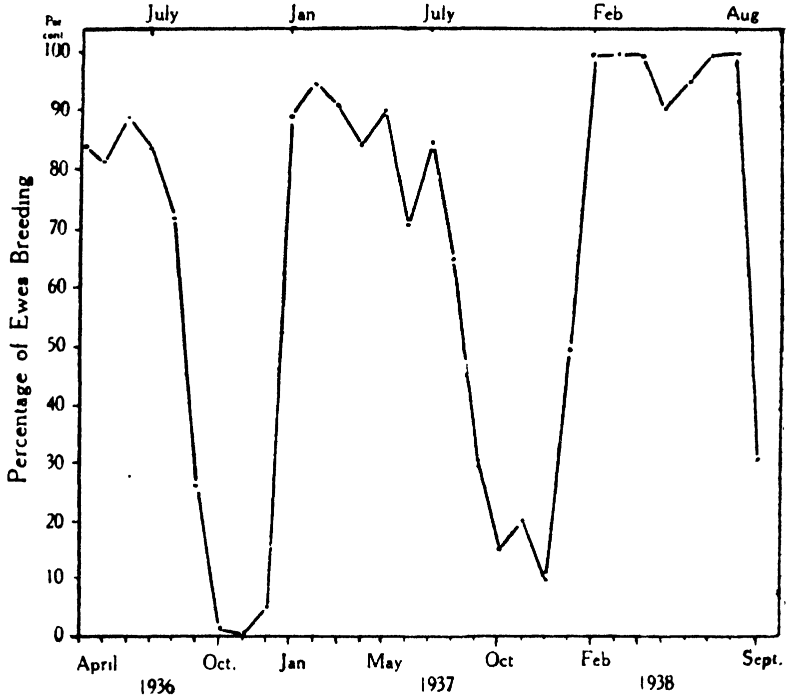


Plate 104.

SHOWING THE EFFECT OF SEASON ON NUMBER OF EWES COMING ON HEAT.

[*Graph by Dr R B Kelley.*

Age is important, because as the ewes reach maturity the incidence of twinning increases. After full maturity is reached, however, the percentage of deaths attributable to lambing increases rather rapidly. These facts are depicted graphically in Plate 103.

It has been clearly established that in Australia ewes running continuously with rams exhibit a definite breeding season. This commences in midsummer, continues on through the autumn and winter, and ceases during the spring or early summer. During this time a maximum number of ewes in the flock come on heat every 16 to 19 days unless they are served by fertile rams and become pregnant. This is expressed graphically in Plate 104.

Work undertaken at Cambridge indicates that these periodic variations in the incidence of heat in ewes is controlled by the amount of daylight to which the sheep are subjected. However, there is a lag between the changes in the length of day and the frequency of heat. This would bring about a decrease in the incidence of oestrus in a flock in the late winter, spring, and/or early summer following the shorter days of winter.

There is field evidence to suggest that there are other factors which may influence the occurrence of heat amongst a flock. Stud records reveal that the majority of ewes conceive about three weeks after the rams are joined. This suggests that the presence of rams amongst ewes which have not been mated for a considerable time may have some effect in stimulating oestrus. At the same time it is known that ewes mated in October-November have given birth to a large number of lambs and this may be attributable to the same cause. In a trial conducted in Northern Queensland it was found that 76 per cent. of the ewes came on heat within 24 days when mated in November. These facts indicate that oestrus or heat may occur in ewes mated out of what might be regarded as the normal season. However, the incidence of oestrus may not be as high at that time of the year as it is between January and August.

THE FERTILITY OF RAMS.

As it is usual to mate only about 2½ per cent. or 3½ per cent. of rams with the ewes, infertility on their part is of major importance An infertile ram may mean that from 30 to 40 ewes do not conceive and this is reflected readily in the reproductive rate of the flock.

The Male Reproductive Organs.

The main organs of reproduction are the testicles (of which there are two), the epididimi, one being attached to each testicle, the vas, the seminal vesicle, and the penis. In addition there are some important glands which secrete some accessory fluids.

The microscopic structure of the testicle is particularly interesting It is composed of a large number of very fine tubules each of which is lined with a layer of tiny brick-like cells. These have the capacity to divide and of undergoing special changes which result in the formation of minute organisms which have a head and a tail and are shaped somewhat like a tadpole. They are known as sperm. The tail of the sperm is very long and mobile. Its lashing movement provides a means of propulsion whereby the sperm swims and, considering its size, the progress it makes is remarkable. Within the tubules of the testicles the sperm are packed together somewhat like a large number of saucers stacked one on top of the other. They move slowly through the tubules till they reach the epididymis. This acts more or less as a marshalling yard where the sperm are collected. They then pass up the fine thick-walled tubes known as the vas. The vasa from each testicle meet at a small vesicle, known as the seminal vesicle, which is used as a storehouse for the sperm. The seminal vesicle is located just near the neck of the urinary bladder and it opens into the base of the penis. Close to the vesicle are the accessory glands. Their function is to provide a medium in which the sperm can swim.

During service the seminal vesicle contracts quickly and the semen is ejected forcibly through the penis. It is deposited in the upper part of the breeding passage of the female and the sperm then begin their journey in search of the ovum.

The testicle is adequately supplied with blood and the veins which carry the blood back to the body are well developed. They are contained within a thick cord which can be felt in the neck of the scrotum or purse and are surrounded by a fairly strong sheath of muscle. This muscle has the power to draw the testicle up close to the body. Both the testicles and the epididimi elaborate male sex hormones which circulate in the blood and govern the development of masculinity of rams.

Plate 105.
NORMAL, HIGHLY FERTILE RAM SEMEN.

The Characters of Normal Fertile Semen.

It is often suggested that as only one sperm is required to fertilize an ovum it does not matter very much if there are a large number of abnormal sperm in a semen sample. This is not the case. Many characters appears to affect the fertilizing capacity of the semen.

Good quality semen (Plate 105) contains an adequate number of normally shaped sperm which are actively motile and are capable of living a long time. In addition, chemical changes indicative of the normal functions of life take place in a sample of semen which has a high fertilizing capacity.

Nature is notoriously wasteful in all matters pertaining to reproduction and accordingly it is common to find 30,000,000 normal active sperm in one cubic centimetre of good quality semen.

As each sperm is capable of fertilizing an ovum, normal semen samples can be diluted into special fluids and used to inseminate artificially a large number of ewes. Probably this has led to some advancing the argument that it does not matter if the semen is deficient in a few hundred thousand or perhaps a million sperm per c.c., or if a few sperm have not got all the characteristics of a good quality sample.

Plate 106.
SEMEN FROM A RAM SUFFERING FROM SEMINAL DEGENERATION.—Note the abnormal tails and the heads broken from the tails.

It is important to remember, however, that even a slight deficiency in any one character of the semen, whether in numbers, motility, longevity, shape, or essential chemical changes, should be regarded as an abnormality, which is likely to render the ram wholly or comparatively infertile.

When the semen fails to show all the characteristics which are considered to indicate it is normal, it is said to have degenerated (Plate 106). Seminal degeneration may be slight or advanced, temporary or permanent. A ram suffering from seminal degeneration which is advanced and permanent is likely to be completely sterile. An animal suffering from seminal degeneration which is slight and temporary may not get many lambs during one joining. He will recover, however, if given appropriate attention and correct management, and during the next joining may secure a large number of lambs.

The following tables indicate the effect which different types of seminal degeneration have on the fertility of rams:—

Percentage Abnormal Sperm.	Percentage Likely Fertility.
0.1	90—100
1.0	60
10.0	45
30.0	30
More than 50.0	0

It is important to understand and to be able to recognise the factors which are likely to bring about seminal degeneration in rams, thereby rendering them infertile.

Factors Influencing the Fertility of Rams.

A large number of factors may adversely influence the quality of the semen produced by rams and the results they produce may be temporary or permanent. Accordingly these are dealt with separately.

(a) Temporary Infertility.

It is known that rams enjoying normal sexual health may produce semen which varies in quality depending on the weather conditions and the diet as well as on the occurrence of arsenic in wool. The details are as follows:—

(i.) *The influence of diet.*—Adequate vitamin A is necessary to maintain the cells lining the tubules in the testicle in good health. These cells are very important because they actually make the sperm. If the ration is deficient in vitamin A the cells degenerate and abnormally shaped sperm without tails are produced. Consequently the fertility of the ram falls.

Russian workers estimate that a ram which is producing as little as 5 c.c. of semen per week requires 13 oz. of digestible crude protein per week for semen production alone.

Both protein and vitamin A are found mainly in green grass but dry grass is notoriously deficient in these requirements. It is doubtful if rams confined to a diet of dry Mitchell grass would get as much as 13 oz. of digestible crude protein per week. They certainly would not get sufficient vitamin A. A certain amount of vitamin A is stored in the sheep's liver during times of plenty, but this is slowly exhausted when the animal is placed on a vitamin A-deficient diet.

At the same time the replenishment of the vitamin A stores of the liver are slow when an adequate ration is provided. These are important points to remember when rams are being prepared for joining. In the north-west and the northern part of the central-west, where the winters are usually dry, the rams are subjected to a prolonged period of vitamin A and protein deficiency, and in consequence the quality of the semen produced by them during the summer is low. It may take from six to eight weeks for the rams to recover and to produce normal semen after being provided with an adequate vitamin A intake, as occurs after the summer rains fall.

(ii.) *The influence of high temperatures.*—It has been clearly demonstrated that high body temperatures of rams may cause considerable seminal degeneration and render the animal comparatively infertile. Several factors can bring about a high body temperature, including

fly strike, or any other fevered condition, exercise, and high atmospheric temperatures. When atmospheric temperatures rise above 72 deg. F the muscles ensheathing the veins of the testicle relax and these glands become more dependent and hang lower than during cool weather.

The exercise associated with long walks for water and/or feed, chasing maiden ewes, or being driven long distances on warm days can easily increase the temperature of rams and thereby bring about a certain amount of seminal degeneration.

Warm weather usually associated with summer conditions will also render rams temporarily infertile. Atmospheric temperatures as high as 95 deg. F with occasional rises to 100 deg. F will have such an adverse effect on rams that they will probably get very few lambs if mated at that time.

No very noticeable symptoms are seen in sheep suffering from seminal degeneration due to hot weather. The testicles may be soft and flabby and lack the resilience associated with the glands of animals producing normal sperm.

(iii.) *The effect of arsenic on the fertility of rams.*—Rams appear to be very susceptible to conditions which are likely to produce seminal degeneration and it is probable that all of these are not, as yet, understood. However it is known that dipping rams carrying half fleece in an arsenic solution or jetting them with arsenic at such a time will have an adverse effect on the quality of the semen produced for as long as about 40 days. Arsenic, however, does not appear to have any very lasting deleterious effect if the rams are carrying less than six weeks wool.

(b) Permanent Infertility.

Several conditions, which are really diseases specific to the male reproductive organs, may render rams permanently infertile. A survey of rams in Queensland indicates that these diseases are fairly common and accordingly a large number of animals which are joined each year are comparatively useless. The specific diseases which cause infertility of rams are:—

(i.) *Orchitis.*—Orchitis is the name given to those conditions in which there is inflammation of the testicle or testicles. It may be caused by a large number of factors, which vary from mechanical injury as occurs in dingo bites to abscesses caused by bacteria. It is usually found that rams suffering from orchitis have one testicle larger than the other and the affected gland may be hot and sore or hard and scarred. In this latter case it may be adherent to the skin of the scrotum and cannot be moved within the "purse" with the ease usually associated with normal healthy testicles.

The effect of orchitis on the general health of the rams varies with the nature and cause of the complaint. If the condition is acute and has resulted from an invasion of the testicle with pus-forming bacteria, the gland becomes hot and sore, the ram may be disinclined to walk and it shows the typical reactions associated with fever. On the other hand, if the inflammation of the testicle has resulted from mechanical injury or from a mild infection by bacteria which runs a slow chronic course, the general health of the ram may not be noticeably affected.

The treatment of rams suffering from orchitis is difficult and it is doubtful if full fertility can ever be restored.

Plate 107.

EPIDIDYMITIS OF RAMS.—Note the normal testicle on the right hand side of the picture and the abnormal one on the left hand side.

[*Photo.: Australian Wool Board.*

Plate 108.

EPIDIDYMITIS OF RAMS.—Note the rounded end on the affected testicle on the left hand side of the picture. The gland on the right is normal.

[*Photo.: Australian Wool Board.*

(ii.) *Epididymitis.*—Epididymitis is the name given to conditions producing inflammation of the epididymis (Plates 107 and 108). This disease is particularly common in Queensland and, as it does not affect the general health of the rams, it often escapes notice.

Careful examination of the testicles will reveal that there is a small peglike structure on the lower end of each gland. This is the tail of the epididymis and its head can sometimes be felt as a slight elevation on the back of the upper end of the testicle. When the epididymis becomes inflamed the head or tail may become enlarged and hardened and under these circumstances can be felt quite easily. Epididymitis is much more common in older sheep than in young ones. In a recent survey it was found that 87 per cent. of the rams over six years of age in a certain flock were affected with this condition. These animals were almost entirely infertile.

The usual history of a ram affected with epididymitis is as follows. The animal becomes less fertile, although there is no gross abnormality of his reproductive organs. Later enlargement of some part of one epididymis is apparent and the animal becomes comparatively infertile. If only one side is affected the ram may become fertile again within about four or five years of first becoming affected. It is hardly worth keeping flock rams in the hope that they will recover.

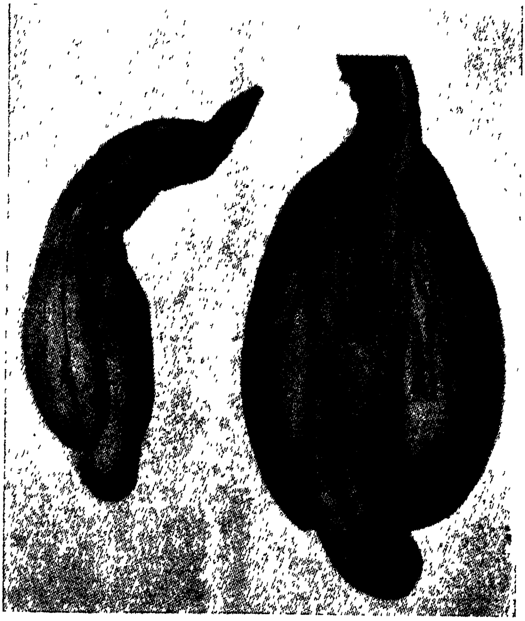


Plate 109.

TESTICLES AFFECTED WITH HYPOPLASIA (LEFT) AND HYPERPLASIA (RIGHT).

(iii.) *Hypoplasia, and hyperplasia of the testicle* (Plate 109).—Hypoplasia means shrinking or shrivelling, while hyperplasia means gross enlargement of a part, organ, or gland. It is not uncommon to find that one testicle is suffering from hypoplasia while the other is showing distinct hyperplasia. Hypoplasia and/or hyperplasia may result secondarily from orchitis, but this is not necessarily the case. In all events it is as well to reject rams suffering from these conditions as they are usually infertile.

Plate 110.

VARICOCELE OF RAMS.—Note enlarged neck of scrotum (I.), the varicosed veins (II.), and the testicle (III.).

(iv.) *Varicocele.*—Occasionally the veins which return the blood from the testicles become varicosed. This is referred to as varicocele (Plate 110). This condition seems to be fairly common amongst rams in Queensland and it can be an important source of lowered lambings. If the condition is advanced it may get quite painful and the sheep become incapable of walking long distances. Rams which are affected to this extent assume a typical humped-up attitude with their back legs drawn up under them (Plate 111).

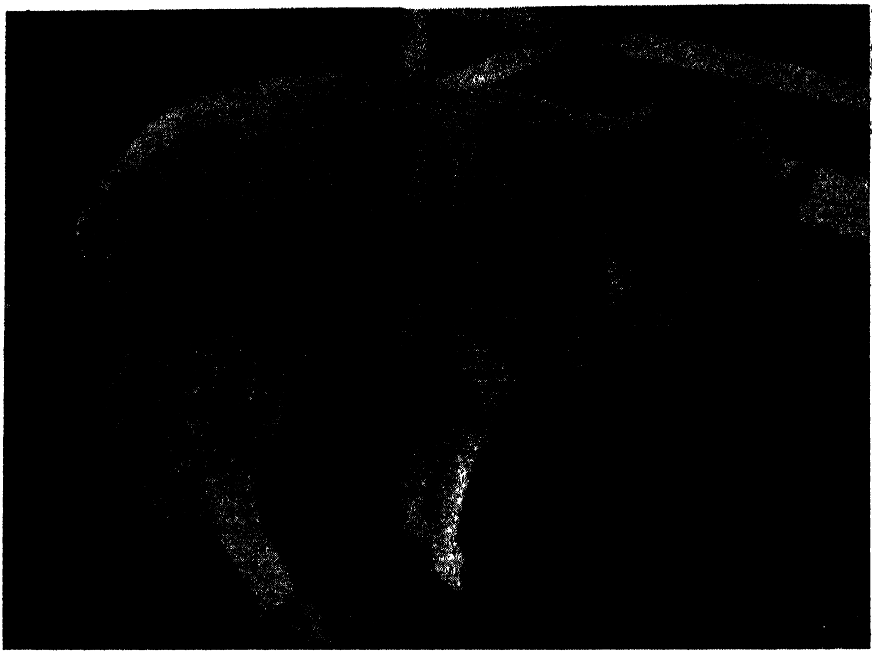


Plate 111.

TYPICAL STANCE OF A RAM SUFFERING FROM VARICOCELE.

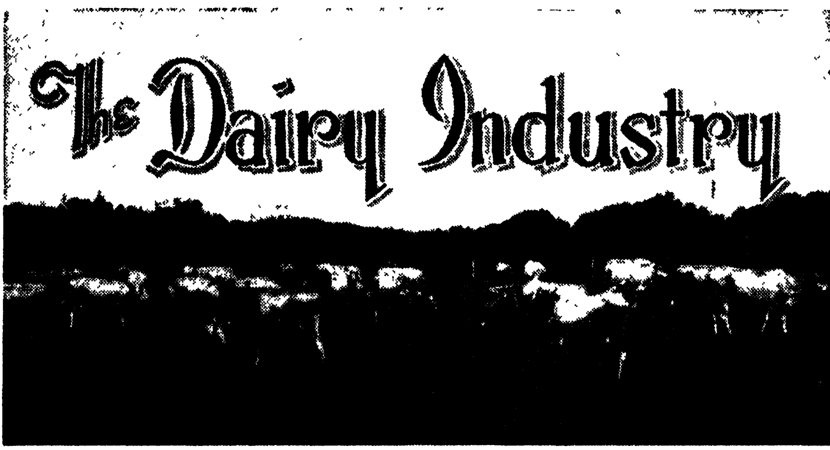
Examination of the neck of the scrotum will reveal a thickening of the veins of the main cord leading down to the testicles. The extent of the thickeneing varies but an important feature is that it is not possible to reduce the swelling.

Varicocele may not produce marked seminal degeneration, but affected rams are often handicapped through not being able to travel very far.

(v.) *Rupture.*—Rupture or hernia is a condition in which a loop of bowel slips through the small slit-like opening in the abdominal wall through which the vas and blood vessels of the testicle pass into the neck of the scrotum. When this occurs the affected animal might become quite infertile

The presence of the loop of bowel in the neck of the scrotum produces a thickening which resembles that seen in varicocele, except that the swelling can be reduced by returning the bowel into the abdominal cavity.

[TO BE CONTINUED.]



Butter Factory Over-run.

V. J. BRIMBLECOMBE, Senior Adviser in Dairying, and F. TREACY, Inspector of Accounts, Dairy Produce Acts.

OVER-RUN is defined as the amount by which the quantity of butter actually manufactured by a factory exceeds the quantity estimated on the butter-fat content of the cream received.

When the supplier's cream is received at the factory it is weighed and tested for butter-fat content and the quantity of commercial butter which can be manufactured from it is calculated by means of a chart designed for the purpose. The figure thus obtained is used as the basis of payment for the cream. Weighing and testing indicate the amount of butter-fat actually contained in the cream, but since, in addition to butter fat, butter also contains water, salt, and a small quantity of milk curd, the actual quantity of commercial butter which can be manufactured from a given quantity of cream is considerably more than the amount of butter-fat it contains. The chart is simply a table showing the quantity of butter which can be made when the butter contains an average amount of water, salt, and curd and it obviates the necessity for making involved calculations. Extracts from these "Butter Computing Tables" as they are called are given below for purposes of illustration—

40 PER CENT. CREAM TEST.		42 PER CENT. CREAM TEST.		43 PER CENT. CREAM TEST.	
Cream. Lb.	Commercial Butter. Lb.	Cream. Lb.	Commercial Butter. Lb.	Cream. Lb.	Commercial Butter. Lb.
40	19·560	40	20·5680	40	21·0720
45	22·005	45	23·1390	45	23·7060
50	24·450	50	25·7100	50	26·3400
100	48·900	100	51·4200	100	52·6800

(In actual practice, factories ignore the decimal points and calculate to the nearest pound.)

The chart quoted is the one in general use in Queensland and it is based on the assumption that the butter manufactured will contain 14 per cent. of water. However, the maximum amount of water which butter may contain under the Dairy Produce Acts is 16 per cent. and buttermakers frequently produce butters having a water content of 15·5 per cent. and higher. It will therefore be readily understood that the quantity of butter actually manufactured usually exceeds the quantity estimated from the chart. This excess is the basis of the over-run.

To ensure that suppliers receive payment for all butter made from the cream supplied by them, the law provides that this over-run be distributed to them in proportion to the quantity of commercial butter which the chart indicates can be made from the cream supplied by them. If, for example, by reference to the chart, a factory estimates from the weight and tests of the cream received that its manufacture for a particular month will be 100,000 pounds and it actually manufactures 102,500 pounds, it is said to have an over-run of 2,500 pounds. This represents 2½ per cent. of its estimated manufacture and in order to distribute this amount to its suppliers each supplier should be credited with an additional 2½ per cent. of the commercial butter already credited to him as calculated from the chart. The following is a typical advice docket showing how the over-run is credited:—

ADVICE DOCKET.

SUNNYMOUNT CO-OPERATIVE ASSOCIATION LTD.

Advice docket showing cream received, butter estimated, and over-run for the month ended 31st May, 1947, on account of John Smith, Alma-den.

Date.	Nett Weight of Cream Received in Grades. Lb.			Test. Per Cent.	Butter Estimated in Grades. Lb.		
	Choice.	First.	Second.		Choice.	First.	Second.
2 ..	64	..	..	36	28	..	..
6 ..	69	..	..	36	30	..	..
9 ..	60	..	..	37	27	..	..
13 ..	..	67	..	36	..	29	..
16 ..	62	..	..	36	27	..	..
20 ..	..	..	61	38	..	..	28
23 ..	..	60	..	37	..	27	..
27 ..	63	..	..	37	28	..	..
30 ..	58	..	..	37	26	..	..
Totals ..	376	127	61	..	166	56	28

Deductions :	£	s.	d.			£	s.	d.
				Choice	166 lb. at 1s. 8½d.	14	3	7
				Over-run, 2½ per cent.	4 lb. at 1s. 8½d.	0	6	10
Cartage ..	0	10	0	First	56 lb. at 1s. 8d.	4	13	4
Goods ..	1	5	6	Over-run, 2½ per cent.	1 lb. at 1s. 8d.	0	1	8
				Second	28 lb. at 1s. 7d.	2	4	4
				Over-run, 2½ per cent.	1 lb. at 1s. 7d.	0	1	7
				Total Gross Pay ..	.. .. ..	£21	11	4
				Total Deductions	.. .. ..	1	15	6
				Nett Pay (Cheque herewith)	.. ..	£19	15	10

Factors Affecting Over-run.

While the foregoing indicates the basis of over-run, there are other factors which affect it, the most important of which are as follows:—

1. Faulty factory scales and irregularities in weight.
2. Inefficient testing and faulty glassware.
3. Slovenly factory practices.
4. Faulty butter composition, low moisture and salt, and loss of salt.
5. Faulty factory equipment.

1. **Weight.**—The correctness of all scales at a butter factory is an important factor in controlling the over-run. Factory scales are periodically inspected by the Weights and Measures Department to test their accuracy, but it should be a routine duty in all factories, before commencing operations each day, to check and adjust them with a standard weight. Weights of cream are very important, and if incorrect due to faulty or unbalanced scales the over-run will be affected. If the weights as recorded are higher than the actual quantity received the estimate of butter manufactured is increased and the difference between it and the butter actually manufactured, that is, the over-run, is decreased. Conversely, if the weights are recorded at a figure lower than the correct amount the estimate of manufacture is lowered and the over-run increased correspondingly. Faulty tare weights on cans will cause errors in cream weight and consequent variations in over-run.

It is the usual practice to weigh cream to the nearest pound. In ordinary circumstances this give and take system works sufficiently accurately and equitably for factory practice.

Care is required in weighing the butter into the boxes for export and local sales. The Commonwealth Government requires every box of butter exported to contain 56 lb. 2 oz. and such butter is always entered in the factory's record of manufacture at 56 lb.; therefore all butter packed in excess of 56 lb. 2 oz. is a direct loss and reduces the over-run. When butter is packed for local sales 56 pounds are required to be weighed into each box, and any excess on this figure also reduces the over-run.

2. **Glassware.**—Careful testing of the cream for its butter-fat content is even more important than accurate weighing. Irregularities in the test can have a far greater effect on the over-run than variations in the composition of the butter. Great care is required to see that the samples for testing are truly representative of the cream to be tested, and that they are taken correctly and kept in numerical order corresponding to the numbers entered in the weight recording book. Correct sampling is most important. For the purpose of testing, 8.8 ml. of cream is assumed to be equivalent to 9 grammes by weight. Actually the weights of individual samples of cream vary slightly with their fat content, but where the physical condition of the cream is normal these variations are not significant from the point of view of factory tests. The sample is taken in a glass pipette and transferred to a testing flask and accurate results cannot be obtained unless the full 8.8 ml. or 9 grammes is actually placed in the flask. Under factory conditions this is frequently very difficult. In the colder weather cream arrives at the

factory in a very thick condition and unless the samples for testing are heated before the cream is pipetted and the residue of cream in the pipette is flushed into the flask with hot water it is unlikely that the full amount will go into the flask. Very often cream from farms where efficient methods of dairy hygiene are not practised becomes contaminated with organisms which cause a fermented or gassy condition, as a result of which minute bubbles occur throughout the mass of the cream. It is impossible to sample such cream accurately with a pipette. The tester fills his pipette to the 8.8 ml. mark, but owing to the gassy condition of the cream a large proportion of the contents of the pipette consists of bubbles and he has much less than 9 grammes by weight of actual cream. Cream in a very gassy condition should be sampled by weighing and not by pipetting. The degree of error which can occur with inefficient sampling is very considerable. Taking 100 lb. of cream with a test of 40 per cent. as a basis, the following table illustrates this point:—

Amount of Sample.		Test Read as.	Commercial Butter (from Chart).	Corrected Test Reading.	Corrected Quantity Commercial Butter	Error in Commercial Butter.
ml	g.	Per Cent.	Lb.	Per Cent.	Lb.	Lb.
8·8	9	40	48·9	40	48·9	..
8·6	8·84	40	48·9	41	50·2	1·3
8·4	8·6	40	48·9	42	51·4	2·5
8·2	8·39	40	48·9	43	52·7	3·8
8·0	8·18	40	48·9	44	53·9	5·0

The remedy for this lies partly with the factory and partly with the supplier. The tester at the factory should take care to warm his samples and flush out his pipette carefully, but the supplier can help also by supplying cream in choice condition. It will readily be seen that apart from the lower rate paid for second grade cream the supplier can penalise himself very heavily by supplying cream in a gassy condition which renders it difficult to sample accurately. Careful attention to dairy hygiene will eliminate this trouble. During the colder months it is advisable for suppliers to send cream to the factory with a lower fat percentage than during the summer months, as such cream does not thicken as much as cream with a high test. The fat percentage in the cream can be varied by adjustment of the cream screw in the separator bowl. The Dairy Produce Acts permit cream to be supplied during the months from April to September with a fat content as low as 34 per cent., whereas the minimum permitted for the warmer months is 38 per cent. The technique of testing should be carried out efficiently and the fat column in the finished test should be bright and clear. Too much or too strong acid, resulting in burning of the fat, will cause a low reading of the test, while too little or too weak acid will cause a high reading.

Incorrect temperatures will have a similar effect. The pipette is calibrated to deliver a volume of 8.8 ml. at 70 deg. F. It is the usual practice in factories to warm the samples up prior to pipetting, and should the samples be abnormally high in temperature at the time of pipetting the volume of cream representing 8.8 ml. in the pipette will weigh considerably less than 9 grammes due to the expansion of the fat

globules and an incorrect test will result. Similarly when the test is completed and ready for reading a temperature of 140 deg. F. should be maintained for correct results. Should the temperature of the fat column be lower than that there is a contraction of its volume, which could give a lower reading than normal. The fat column should be read quickly on removal of the testing flasks from the centrifuge and the full reading according to the Dairy Produce Acts given, i.e., from the bottom of the fat column to the top of the meniscus. Should the reading be taken from the bottom of the fat column to the bottom of the meniscus an error in the reading of approximately 1 deg. will occur, a test of 40 per cent. for example being read as 39 per cent.

Errors of this type affect the estimate of manufacture and consequently the over-run in the same way as faulty weighings. Care should be taken to see that all glassware used in testing has been approved by the Department of Agriculture and Stock. Such approval is indicated by the symbols D Q A on the glass. Faulty or broken glassware should be discarded. Broken-tipped pipettes or broken-necked testing flasks can cause irregularities in testing which will affect the over-run.

3. **Factory Practices.**—All factory operations should be carried out with care. Losses of cream after weighing through spillage and carelessness have a direct bearing on the over-run, as in such circumstances less cream is available for churning and the quantity of butter actually manufactured will be lowered. Careless handling in this way may even bring about an under-run. Slovenly methods of performing the operations of neutralization, pasteurization, and butter-making can adversely affect the over-run; e.g., churning at high temperature, or shortly after pasteurization, incomplete churning, and churning to a very small grain raise the fat losses; while inefficient packing and failure to salvage butter adhering to the inside of churns and to barrows and packing machines cause serious losses of the finished product.

4. **Butter Composition.**—Faulty butter composition, low moisture and salt content and loss of salt also affect the over-run. The composition of the butter is an important factor in the manufacture of the product and has an important bearing on the over-run.

The following chart is given as an example:—

SHOWING HOW WATER AND SALT AFFECT THE COMPOSITION OF BUTTER AND FACTORY RETURNS FROM BUTTER SALES.

Analysis of Butter.				Annual Output.		Gross Receipts from Butter Sales.		Receipts per Lb. Fat.	
Water. %	Salt. %	Curd. %	Fat. %	Fat. lb.	Butter. lb.	At 165/- Cwt. £	At 200/- Cwt. £	At 165/- Cwt. Pence.	At 200/- Cwt. Pence.
15·7	1·5	0·8	82·0	820	1,000	165,000	200,000	21·56	26·13
15·2	1·0	0·8	83·0	820	987·95	163,012	197,590	21·30	25·82
14·5	0·7	0·8	84·0	820	976·19	161,071	195,238	21·05	25·51

This table has been prepared to illustrate the way in which inefficient water and salt control can cause serious losses. The first section of the table shows the high percentage of fat in butters which have low percentages of water and salt. While the position has markedly improved

in the course of the last three or four years, it is unfortunately true that butters containing over 83 per cent.—sometimes as much as 84 per cent.—of fat are still being marketed. The second section of the table shows the quantity of butter which would be manufactured in each case from a basic figure of 820 tons of fat. It will be noted here that when butter containing 84 per cent. of fat is produced, the quantity of butter made is 24 tons less than if it contained 82 per cent. of fat. The effect of this on the gross receipts from butter sales is shown in the third section, where it will be seen that at 165s. per cwt. the monetary loss amounts to £3,928, while at 200s. per cwt. the loss amounts to £4,762. The fourth section of the table shows the figures from the third section reduced to receipts per lb. of fat sold. It will be observed that the loss due to lower water and salt content amounts to one half-penny per lb. of fat at 165s. cwt. and three-fifths of a penny per lb. at 200s. per cwt.

Loss of salt is a factor contributing in some measure to high fat percentages and low over-run. There is no reason why salt should be added to the churn and portion of it then drained or "washed" out. Admittedly, salt is not expensive, but the cumulative losses of salt over a year can amount to a very considerable sum. For example, in a factory producing 1,000 tons of butter a year, where salt is added at the rate of 2 per cent. of the butter, 20 tons of salt are used. If a quarter of this salt were lost the loss would be 5 tons a year, the approximate value of which would be £50, a loss of nearly £1 a week.

5. **Factory Equipment.**—All factory equipment should be maintained in first class condition, as leaking joints in pipelines, leaking churn doors, faulty butter milk strainers and bad pat butter cutters cause losses which affect the factory efficiency and over-run.

Amount of Over-run.

It has been shown that the principal factors affecting over-run are efficient weighing, sampling and testing of the cream and the percentage of water and salt in the finished product although other factors have some influence on it. The supplier will naturally be interested in the percentage of over-run which he can expect in normal circumstances. Generally speaking the over-run should not be more than 3%. If it exceeds 3% the weights and/or the tests of cream recorded are low or the butter is being marketed with more than the percentage of water permitted by law. If it is unduly low or an under run occurs, the weights and/or the tests of cream recorded are high or inefficiency in the factory is causing losses in manufacture either by actual losses of butter or by marketing butter with a low percentage of water. It must be mentioned however that it is frequently impracticable for a factory which does a considerable trade in fresh cream to show any over-run or if one is shown it will be very low.

Summary.

It will be apparent that a high over-run does not necessarily indicate greater factory efficiency. Except where it is the result of careful attention to the composition of the butter resulting in high water and salt content, a high over-run in fact usually indicates inefficiency in weighing and testing the cream when received. It must be realised, of course, that testing in factories cannot be expected to reach laboratory standards of accuracy but it is felt that this matter of accuracy deserves much more consideration than it appears to receive in some factories, especially in

regard to the technique of sampling. With regard to weighing, both of the cream when received and of the butter when being packed, the responsibility for accuracy lies with the factory staff. In this connection a word might be said about the packing of butter for export. The regulations of the Department of Commerce and Agriculture require that at least 56 lb. 2 oz. be packed into every box of butter for export. Factory managers should ascertain the minimum quantity which is required to ensure that the box contains this weight at the port of shipment. If a factory packing 20,000 boxes per annum weighs only one ounce more than is necessary into each box, its loss on one year's operations from this cause alone would be more than half a ton of butter.

Losses of fat in churning can be considerable. Investigation has shown that in some cases over two per cent. of the fat in the churn has been lost in the butter-milk. Frequent tests of the butter-milk should be a regular feature of factory routine and where losses of fat appear to be unduly high a careful study of pasteurizing and churning technique should be made.

When world industry is on a normal footing again, butter is likely to encounter serious competition from other edible fats and the greater the efficiency of the industry the better able will it be to hold its place.

Secretion of Milk.

Contributed by the Division of Dairying.

Introduction.

THE practical importance of the milk of the cow makes a knowledge of her udder more important than an understanding of that of any other species. The monotony mentally associated with the act of milking almost universally inhibits thought about the wonder of milk formation. Yet competent authorities have established that a sympathetic insight into the operation of the udder can improve the production of milk by at least 10 per cent. and of the butterfat content by up to 40 per cent.

Structure of the Udder.

1. *Exterior of the Udder.*—The udder of the mature cow normally consists of *four functional glands*. It varies in weight from 25 to 60 lb. (exclusive of milk). This variation is due to differences in age and *lactation* as well as in the amount of *secretory and connective tissue*. The udder, being a skin gland, is not directly connected with the abdominal cavity except by the *inguinal canal*. The inguinal canal forms a potential tube about 4 inches long, through which the blood and *lymph vessels* and *nerve fibres* can leave the abdominal cavity to enter the udder of the female or the *scrotum* of the male.

The udder, though often described as being square in shape, is, in reality, more like the handle of a tea cup.

An *intramammary groove* separates the right and left halves. In some cows the fore and rear quarters are smoothly joined together, so that there is no distinct demarcation. In others, various degrees of grooving or quartering are observable.

The shape or size of the teat which drains each gland seems to bear no relationship to the shape or size of the udder.

The skin which covers the udder has little supporting action. Its function is to protect the udder, and, in addition, to prevent too much swaying of the gland when the cow is moving.

2. *Interior of the Udder.*—The udder proper is a bag of complex tissue, the greater part of which consists of a soft, spongy, greyish-pink mass made up of connective tissue, muscle, blood vessels, nerves, and fat. Above each of the four teats is a milk reservoir or cistern varying in capacity up to one-quarter pint. Small blood vessels and capillaries carry blood through every part of the organ, while numerous nerves regulate the flow of blood and the formation of milk. In addition, small, round *gland-lobules* occupy a large part of the udder. The gland-lobules are connected by tiny tubes to milk ducts and resemble grapes on a bunch. The inside of each gland-lobule is lined with a large number of microscopic bodies (*alveoli*), the walls of which are lined with from 50 to 150 *epithelial cells,* and within which milk is formed.

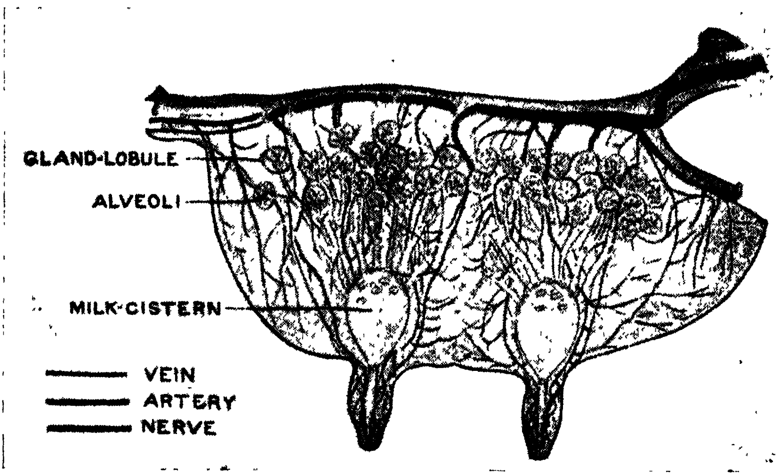


Plate 112.

A SECTION THROUGH THE UDDER.

Here these substances of which milk is composed (*precursors*) are taken from the blood plasma and passed through the neck of the lobule into a branch milk duct to a main duct and thence to the reservoir. *Sphincter muscles* placed round the teat canal below the reservoir prevent loss of milk. The canal which runs through the *sphincter* is from ¼ to ½ in. long and is known as the *papillary duct* or *streak canal.*

A loose fold of *mucous membrane* (*Furstenberg's rosette*) at the upper end of the papillary duct reinforces the action of the sphincter in effectively blocking the escape of milk from the udder. The *streak canal,* in addition to checking the escape of milk, also serves to prevent the entrance of bacteria and other foreign materials into the gland proper.

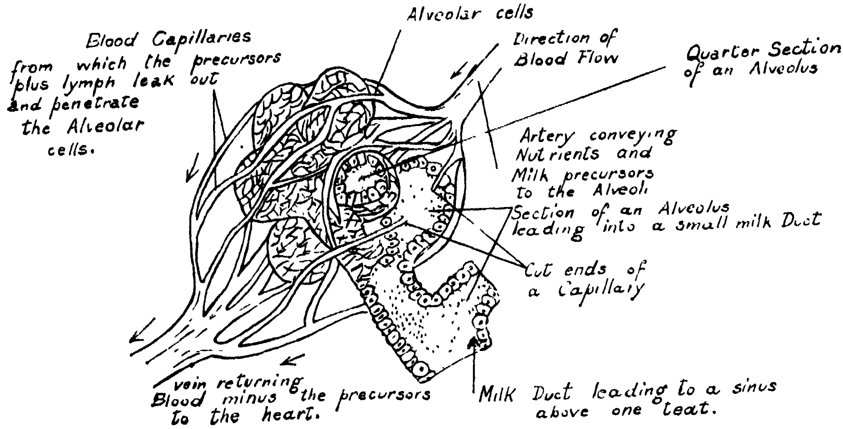


Plate 113.

The foregoing diagram illustrates a bunch of secretive alveoli. Note how the blood capillaries are distributed among them. This gives an idea of the actual contact between the blood stream and the alveoli.

How Milk Secretion is Controlled.

These diagrams attempt to show how secretion is finally stopped by pressure of milk within the udder itself—(1) at fourteen hours secretion and (2) at six hours. The *alveolar cells* are flattened and distorted in the distended alveolus, which prevents secretion partly. The main cause probably is the fact that the distended alveoli compress the thinner walled veins traversing the udder tissue and so stop most of the blood flow. In these diagrams alveoli are only partly distended and no pressure is exerted on the regional veins. The varying size of the alveolar cells denotes active secretion, as some are on the point of bursting, while others have just burst and collapsed. Midway stages also occur.

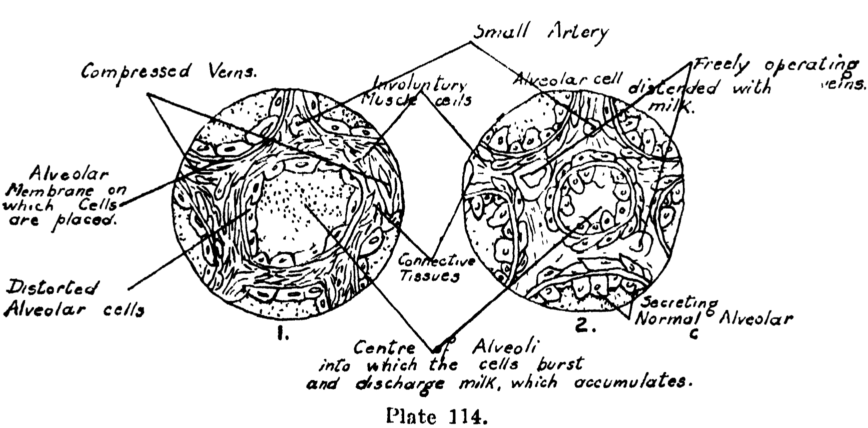


Plate 114.

Method of Secretion.

Blood circulates through the udder, and from its arterial blood vessels clear *plasma fluid* leaks out into and around the tissues carrying all the necessary precursors of milk. *Precursors* are the simple substances from which milk is derived. They are the substances which are built up into butterfat, sugar, ash and *caseinogen* in the *milk secreting epithelial cells* that line the ducts and milk pockets (*alveoli*) of the udder. This process goes on continuously and results in the extrusion of fully formed milk from the secreting cells into the ducts leading to the cisterns above the teats. The secreting cells are factories, and, at the same time, a barrier between the milk pockets and ducts on the one hand and the blood plasmas on the other.

The walls of the alveoli, the ducts, and the cisterns are elastic and muscular, but 40 per cent. of a cow's milk production can be held in them before the vessel shows signs of distention. From the sixth to the eighth hour after milking, pressure in the udder rises, the rate of milk formation slows down, and finally stops at about the twelfth to fourteenth hour in the average producer due to the pressure of the milk itself acting on the secreting cells and blood vessels. In this slowing-up period the secretion of butterfat is retarded and the tiny fat droplets tend to remain in the deeper and finer milk ducts and pockets lightly adhering to the sides; butterfat is not dissolved in milk as sugars and *proteins* are, but is suspended as tiny droplets. From experience, it is inferred that milk secretion is a continuous process and that a large proportion of the milk withdrawn at any milking is collected and stored within the gland before the milking process is commenced.

Rate of Secretion.

The pressure within the udder (*intramammary pressure*) is least immediately after milking. As the pressure of the accumulating products gradually increases there is a corresponding drop in the rate of milk formation. (See above for explanation of this phenomenon.) Though the rate of milk secretion is very difficult to estimate, some authorities state that each hour's milk production is 95 per cent. of the production of the previous hour. The percentage is probably affected by the stage of lactation and other factors. For example, it is known that considerable milk can be left in the udder of the recently fresh cow without causing any appreciable decline in milk production. Milk pressure at the base of the teat usually varies from 25 to 35 mm. of mercury. However, it may be considerably higher in fresh cows or in individual cows.

Intramammary Pressure.

The pressure which occurs before the udder is stimulated, but several hours after milking, is probably due (1) to the weight of milk in the milk cisterns, and (2) to the pressure resulting from the secretion of milk. The pressure may vary markedly with the type of udder, but it usually bears a close relationship to the productivity of the cow.

Difference in Composition of First and Last Drawn Milk.

Normally, the milk first drawn from the udder contains less fat than the last drawn milk. Many theories have been advanced to explain this phenomenon. That of Turner seems to offer the most satisfactory explanation. He suggests that the pressure of the accumulating milk in the udder results in the large fat globules being retained in the

secretory cells of the alveoli. The water and soluble substances which escape more easily, collect in the *lumina* of the alveoli, and thereby offer resistance to the emptying of the secretory cells. The fat globules thus tend to escape less readily as the pressure increases. The "creaming theory" which has been very popular over a long period is no longer regarded as being tenable for a number of reasons which it is not intended to discuss here.

"Letting Down."

One of the most intriguing problems for the milker is the manner in which the cow "holds up" or "lets down" her milk. "Letting down" of milk is brought about by the contraction of muscle fibres around the ducts and cisterns; and even the alveoli have muscle fibres which contract them to a smaller sphere. These muscles are controlled by nerves belonging to the *sympathetic system*, over which the cow has only indirect control. When the nerve endings in the teat are stimulated, the stimuli are carried by the nerves to a small gland (*the pituitary gland*) at the base of the brain. As a result of this stimulus a *hormone* (*oxytocin*) is secreted by the pituitary gland into the blood stream which carries it to the udder, where the hormone causes the muscle fibres around the *milk-secreting sacs* to contract. At this stage flow of milk becomes rapid. All the milk should be removed as rapidly as possible, because the muscle fibres around the alveoli soon become fatigued and relax after six to seven minutes. Observance of the following simple rules stimulates "let down":—

(1) Warm water udder washes one minute prior to milking.

(2) Rapid milking in from three to four minutes per cow.

(3) Complete milking.

Stimulation of the "letting down" process also depends upon the cow's receiving an habitual and congenial association of ideas at each milking time. The sucking of teats by the calf is a natural stimulus to the "letting down" of milk by the cow. The manipulation of the teats by the milker becomes associated with this conditioned reflex. The cow may thus be quite easily conditioned to a pair of strong but kind hands rapidly drawing the milk down, coupled with a confident attitude of the milker towards the cow. Fear and excitement result in secretion of *adrenalin* by the adrenal gland, which inhibits contraction of muscle fibres around the milk secreting sacs and consequently the cow "holds up" her milk.

Conditioned reflexes help to explain why regularity in feeding and milking pays.

Acknowledgment.

In the compilation of this article the standard works of Espe, Petersen, and others have been freely consulted.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the advanced register of the A.I.S., Jersey, Ayrshire and Guernsey Societies' Herd Books, production records for which have been compiled during the month of April, 1948. (273 days unless otherwise stated).

Animal	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE (STANDARD 350 LB.).				
Sunryview Evelyn 9th	J. Phillips, Wondai	13,056·75	530·98	Sunnyvale Monarch
Trevor Hill Dove 2nd (231 days)	G. Gwynne, Umbiram	10,474 80	466·839	Corunna Supreme
Roshill Queenie 4th	W. Flesser, Boyland	12,294·90	463·323	Dnalwon Felix
Merridale Dimple	Giles Bros., Woowonga	11,692·1	450·247	Blacklands Heir
Blacklands Joan 8th (229 days)	A. Pickels, Proston	9,504 8	440·163	Blacklands Sultan 2nd
JUNIOR, 4 YEARS (STANDARD 310 LB.).				
Greyleigh Gem 196th	W. H. Thompson, Nanango	12,877·25	470 615	Greyleigh Wootan
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Valera Roseleaf 16th	Sullivan Bros , Pittsworth	14,527 51	585 617	Alfa Vale Pride 2nd
Valera Roseleaf 17th (191 days)	Sullivan Bros.. Pittsworth	8,048	325·622	Alfa Vale Pride 2nd
Blacklands Joan 10th	A. Pickels, Proston	7,858·55	316·101	Blacklands Maiden's Monarch
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Blacklands Foremost 42nd	A. Pickels, Proston	8,358·1	320·97	Blacklands Maiden's Monarch
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Valera Una 5th	Sullivan Bros., Pittsworth	9,459·89	415·151	Alfa Vale Pride 2nd
Alfa Vale Star 15th	W. H. Thompson, Nanango	9,876·45	411·814	Alfa Vale Stalin
Yarranvale Bounce	K. A. Ruhle, Motley	7,056·1	266·963	Alfa Vale Pride 10th
Merrivale Rosebud 2nd	Estate W. Soley, Malanda	7,066·2	255·818	Greyleigh Mosstrooper
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Trevor Hill Twinkle 4th	G. Gwynne, Umbiram	7,983	325·156	Trevor Hill Bosca
Roshill Almond 6th	W. Flesser, Boyland	7,730	268·125	Dnalwon Felix
Yarranvale Joyful	K. A. Ruhle, Motley	6,838·3	251·879	Yarranvale Prospector
AYRSHIRE.				
MATURE (STANDARD 350 LB.).				
Fairhill Butterfly	M. J. Brownlie, Nangwee	9,556·45	448·678	Fairhill Royal Laddie

JERSEY.

MATURE (STANDARD 350 LB.)				
Brookland Cunning Drop	W. S. Conachie, Sherwood	12,800·4	752·253	Englorie Cunning Victor
Brookland Rosemond	W. S. Conachie, Sherwood	10,340·5	512·24	Brookland Sultan's Rostrum
Windsor Lady Gladys	H. G. Johnson, Beaudesert	10,318·75	511·523	Brookland Sultan's Victory
Brookland Gold Leaf	W. S. Conachie, Sherwood	8,607·15	498·126	Brookland Gold Standard
Inverlaw Sirius (365 days)	R. Crawford & Sons, Kingaroy	9,033·85	474·755	Oxford Royal Lad
Gem Aster	W. Bishop, Kenmore	8,891·65	442·983	Calton Lothean
Sylvale Brown Succeed	A. Semgreen, Coolabunia	9,134·6	420·279	Oxford Brown Lad
Glenrandle Golden Girl	P. Kerlin, Killarney	7,229·2	411·037	Bellgarth Stylish
Romsey Dainty Rose	J. Wilton, Killarney	7,412·8	410·888	Oxford Dainty Peer
Romsey Skylark	J. Wilton, Killarney	6,645·8	384·319	Romsey Bright Boy
SENIOR, 4 YEARS (STANDARD 330 LB.).				
Boree Cute Comedy	W. and C. E. Tudor, Gayndah	8,457·82	411·41	Trinity Cute Commodore
JUNIOR, 4 YEARS (STANDARD 310 LB.).				
Nairfale Lady Laura	R. J. Browne, Yangan	7,780·5	414·937	Nairfale Noble Count
Romsey Countess 2nd	J. Wilton, Killarney	7,329·1	403·879	Romsey Golden Victor
Nairfale Brown Belle	R. J. Browne, Yangan	7,686·9	387·453	Nairfale Count's Prominence
Gem Glamour Girl	V. Bishop, Kenmore	8,269·55	373·101	Calton Lothean
Glenrandle Luna	M. J. Kerlin, Killarney	6,334	371·849	Bellgarth Stylish
Grasmere Victorius Dove	F. Z. Eager, Neurum	6,407·1	342·791	Navua Victorious Samaritan
SENIOR, 3 YEARS (STANDARD 290 LB.)				
Glenview Golden Eblis	F. Z. Eager, Petrie	6,492·05	353·907	Trinity Governor's Hope
Tecoma Petal	A. Semgreen, Coolabunia	5,819·7	319·751	Trinity Golden Royal
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Tecoma Brown Lass	A. Semgreen, Coolabunia	7,052·2	409·219	Trinity Golden Royal
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Ellerdale Gamboge Tidy	A. L. Dahl, Taragoola	7,244·7	390·593	Ellerdale Prince's Gamboge
Inverlaw White Star	R. J. Crawford & Sons, Kingaroy	5,669·5	335·233	Oxford Royal Lad
Delrose Melba	F. C. Leschke, Wanora	6,082·50	323·473	Oxford Erin's Victor II.
Lermont Madeira 3rd	J. S. McCarthy, Greenmount	5,725·6	318·543	Trinity Noble Effort
Grasmere Victorious Pontorson	F. Z. Eager, Petrie	6,090·7	316·723	Oxford Brown Victory
Kinross Vida	H. R. Randall, Woowoonga	5,540·1	282·666	Kinross Jester
Romsay Pam	J. Wilton, Killarney	4,681·3	277·592	Oxford Pixie's Victor
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Brookland Merry Rosanna	W. S. Conachie, Sherwood	7,196·45	417·448	Brookland Maria's Keepsake
Romsey Bonnie Beauty	J. Wilton, Killarney	7,534·5	397·343	Bellgarth Lancer 3rd

Production Recording—*continued.*

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	JERSEY—*continued.*			
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Glenrandle Lottie	P. Kerlin, Killarney	6,047 5	347·698	Bellgarth Glory King 2nd
Brookland Regal Maid	W. S. Conochie, Sherwood	5,703·1	325·037	Brookland Regalia
Myrtledale Sybil	H. Sigley, Jaggan	5,258·4	323·033	Palm Ridges Golden Symbol
Somersley Pixie Lass	H. R. Randall, Woowoonga	6,960·7	313·837	Trinity Dreaming Lad
Grasmere Victorious Ermington	F. Z. Eager, Petrie	5.702 2	288·809	Navua Victorious Samaritan
Inverlaw Comic	R. J. Crawford & Sons, Kingaroy	5,151·05	256·892	Oxford Royal Lad
Grasmere Victorious Brittania	F. Z. Eager, Neurum	5,144·95	254 430	Navua Victorious Samaritan
Inverlaw Royal Petal	R. J. Crawford & Sons, Kingaroy	4,984·45	253 331	Oxford Royal Lad
Wavemere Rosemary	A. L. Dahl, Taragoola	4,939·7	251·921	Oxford Mighty Ajax
Myrtledale Cedar (228 days)	C. J. McKell, Jaggan	3,875·65	244·193	Oxford Remys Count
	GUERNSEY.			
	MATURE (STANDARD 350 LB.).			
Laureldale Mirabel's Patch	W. A. K. Cooke, Witta, Maleny	12,124·7	550·87	Laureldale President
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Laureldale Pamela (365 days)	W. A. K. Cooke, Witta, Maleny	11,698·4	569 049	Minna Murra Topsy's Sequel
Bungalow Vale Vanity Fair 3rd	W. A. K. Cooke, Witta, Maleny	9,663·9	464·883	Yarraview Factor

Health in the Hatchery.

P. RUMBALL.*

WITH higher costs of production and the need to build up the poultry flocks of this State to permit of increased exports of eggs and poultry meat to Great Britain, hatchery owners and those engaged in the rearing of chickens should review last season's operations with the object of doing better, if possible, during the coming hatching season.

Packed within the fertile egg should be all the essentials for the hatching of a healthy vigorous chicken. This, however, depends on the health of the hen and the ration fed.

A Cause of Chicken Mortality.

Pullorum disease, the most serious chicken disease, is at times the cause of heavy chicken mortality. It is transmitted from parent to offspring through the egg. The parent may not look unhealthy, and the only method of determining whether a bird is infected or not is by a blood test. Hatchery owners in collaboration with the Department of Agriculture and Stock have done much to ensure that the hatching of chickens should be reasonably free from pullorum disease. Almost a quarter of a million breeding birds will have been tested for hatchery owners by officers of the Department by the end of June. This is about 30,000 more than were tested last year, consequently a greater output of chickens during the coming season may be expected.

Protection from Infection.

The blood testing of breeding birds, however, is only one factor in the control of this disease, and hatchery owners should follow up their good work and protect chickens from infection from other sources. These other sources are infected incubators, chicken boxes, and brooders. All the plant used in the hatching and rearing of chickens should first be thoroughly cleansed and then disinfected. Disinfection is of little use without the cleansing process. During the season the machine and fittings at hatching time become soiled. The cleansing

* In a *Country Hour* broadcast from 4QG and published by courtesy of the Australian Broadcasting Commission.

and disinfection should follow each hatch. With many types of incubators, disinfection is somewhat difficult and fumigation is necessary. To those unfamiliar with the process of fumigation it is recommended that they consult departmental advisers, but it is little use fumigating incubators and egg trays to which masses of excreta or egg material are adhering without such trays being first thoroughly cleansed, as the gas cannot penetrate the solid masses sometimes seen in incubators.

Importance of Correct Feeding.

The nutrition of the parent bird is most important. Without correct nutrition, that percentage of hatched chickens which makes for economy of production is not obtained, nor are those that are hatched as strong and lusty as they should be.

Many are of the opinion that if the birds are laying well they are being correctly fed, but this is not so if the eggs are to be used for hatching. It has been definitely determined that for good hatchability greater quantities of vitamin A and B2 (riboflavin) have to be available to the birds if satisfactory egg production is to be obtained.

The cheapest source of vitamin A is green feed. Chaffed green lucerne, oats, barley, and rape are good sources of this vitamin. Unfortunately, green feed is generally in short supply during the breeding season. A good grain source is yellow maize, but to supply breeding birds with all the vitamin A they require through maize the whole ration would have to consist of this grain. This system of feeding would not permit of economy in production of the eggs required, consequently fish oils or vitaminized emulsions are usually included in the breeders' rations to assure a sufficiency of vitamin A. Hatchery owners who cannot supply all the succulent greens that their birds will consume are therefore recommended to use vitaminized preparations and, as these are not all of the same potency, to use them as directed by the vendor. With baby chickens vitaminized preparations are almost essential, particularly if the ration is largely composed of white grains, as young chickens have not the capacity to consume green feed in quantity to ensure them against a vitamin A deficiency.

Vitamin B2 or riboflavin is equally as important for the prevention of the loss of chickens dead in shell. Green feed is again a good source of supply but the best available sources are milk powders and liver meals. The inclusion of about 4 per cent. of buttermilk powder or about 3 per cent. of liver meal in the mashes supplied to breeding stock, in addition to what is supplied by the other ingredients of the ration, will ensure a sufficiency of riboflavin.

The need for a sufficiency of vitamins A and B2 cannot be too strongly stressed, both for breeding birds and growing stock. During the 1945 hatching season a survey of some hatcheries in localities near Brisbane was made. The average hatchability of all eggs set in 17 of the better-fed groups of birds was 72 per cent. while, in 9 groups of those upon a poor plane of nutrition, the hatchability was as low as 45 per cent. During the 1947 season, several cases of a deficiency of one or both of these vitamins came under our notice.

Manganese Deficiency.

There is another deficiency that hatchery owners might experience in districts where bran and pollard are not readily available, and that is manganese. A shortage of this mineral is a cause of an increased percentage of crippled chickens and poor egg shell quality. Whole grains are not a good source of supply, maize being particularly poor. The shortage can be overcome by the addition of commercial manganese sulphate to the ration at the rate of 4 ounces to the ton. The best method of incorporating this in the mash is to first add 4 ounces of manganese sulphate to 20 lb. of salt and to add 1 per cent. of this manganese sulphate salt mixture to the mash. The use of manganese sulphate is recommended in all districts where maize forms the greater part of poultry rations.

Early Action Necessary.

The present hatchery capacity of Queensland is approximately $1\frac{3}{4}$ million eggs every three weeks. The loss of chickens that could occur through the improper nutrition of even a small proportion of our breeding flocks could therefore be enormous.

Poor hatching caused by incorrect feeding can be corrected fairly rapidly and hatchery owners experiencing this trouble should contact a poultry adviser of the Department of Agriculture and Stock as early as possible in the season.

CLEAN-EGG NEST.

A South Australian has won £25 for inventing a hen's nest which will keep eggs clean.

His design was entered in a competition conducted by the Australian Egg Producers' Council when the British Ministry of Food decided to accept only unwashed eggs from Australia, after tracing deterioration in transit to the practice of washing eggs after collection from the nests.

The competition attracted elaborate and weird inventions. One had gear wheels, a conveyor belt, and a drawbridge. But the prize-winning nest was simple. The floor of the nest is of fine mesh wire netting, tightly stretched and having a slope to one side. Straw is packed underneath the netting for warmth. The egg, when laid, rolls into a receptacle at one side where it is safe from the hen's muddy feet.

FEEDING OF POULTRY.

At the present time economy in the feeding of poultry is particularly necessary, but much wastage of food occurs on many farms. Common causes of such waste are faulty dry feed hoppers, lack of suitable troughs for feeding wet mash, over-feeding, and unsuitable facilities for the storage of food. It can be prevented in the following ways:—

If dry mash is fed the hopper should be so constructed that the food cannot be scratched out by the birds.

Where wet mash is fed it is necessary to provide sufficient troughs of a suitable type. These can be made of galvanised iron or wood.

To avoid waste by over-feeding the birds should be given only as much feed as they will consume within about an hour of feeding.

Suitable storage bins should be provided so that a number of bags of the different classes of foodstuffs can be emptied into the bins, thus saving the wastage which mostly occurs when the feed is taken from the bags as required.

Junior Farmers' School.

THE first of a series of special schools of instruction for members of Junior Farmers' Clubs was held at the Queensland Agricultural High School and College from 27th April to 7th May under the direction of the State Organiser, Mr. T. L. Williams.

Boys selected for the course were representative of clubs in various parts of the State. Enrolments were:—

Darling Downs.—Denis B. Doyle, Clinton Vale, Warwick; John K. McDonnell, Greymare, Warwick; Gordon T. McLennan, Willowvale, Warwick; Beres Eastwell, Willowvale, Warwick; Gordon T. Reid, Willowvale, Warwick; Michael J. Rossiter, Wild-Ash, Warwick; Edward W. Cooper, Murray's Bridge, Warwick; Kevin P. Cooper, Murray's Bridge, Warwick; Vincent G. Nicholls, Pratten, *via* Cunningham; Benjamin R. Walsh, Goombi, *via* Chinchilla; Edward Chapman, Greenmount; Thomas A. Smooth, Pinelands, Crow's Nest; Reginald C. Blanck, Ravensbourne, Toowoomba; William McConnell, Milmerran; Stanley T. Fowler, Pittsworth; Colin A. Cornford, Pittsworth; William J. Sullivan, Pittsworth; John R. Wanka, Pittsworth; Francis A. Rowen, Pittsworth; William J. Grayson, Killarney; Laurence R. Brunton, Killarney; Reginald O. Madsen, Yangan.

Lockyer.—John D. Brooks, Lilydale, *via* Helidon; Sydney S. Sticklen, Lilydale, *via* Helidon; John R. Sticklen, Lilydale, *via* Helidon.

Beaudesert.—Raymond R. Hopkins, Woodhill, *via* Beaudesert.

Wide Bay.—Leo R. Jones, Kilkivan.

South Burnett.—William F. Silburn, Goomeri.

Central Burnett.—William R. Foster, Coalstoun Lakes, *via* Biggenden; Stanley R. Hunter, Coalstoun Lakes, *via* Biggenden.

Plate 115.

FIRST QUEENSLAND JUNIOR FARMERS' CLUB SCHOOL, APRIL-MAY, 1948.

Sitting (left to right): B. R. Walsh, J. K. McDonnell, J. R. Wanka, T. A. Smoothy, T. L. Williams (State Director, Junior Farmers' Organisation), S. T. Fowler, L. R. Jones, E. Chapman, W. J. Sullivan.

Standing (left to right): W. R. Foster, R. O. Madsen, G. T. Reid, S. W. Sticklen, G. T. McLennan, J. D. Brooks, D. B. Doyle, W. McConnell, W. F. Silburn, F. A. Rowen, V. G. Nicholls, R. C. Blanck.

Plate 116.
JUNIOR FARMERS NOTING THE POINTS OF A JERSEY HEIFER.

In co-operation with the Department of Public Instruction, the Department of Agriculture and Stock assisted with the arrangements and supplied lecturers for the course. The syllabus included the following:—

Plant Industry.—"Soil Science," by W. J. Cartmill, Senior Soils Technologist; "Silo Construction and Silage," by W. H. Bechtel, Chief Adviser in Agriculture; "Soil Conservation," by A. F. Skinner, Soil and Conservation Officer, Bureau of Investigation of Land and Water Resources.

Animal Industry.—"Pig Raising," by E. L. Melville, Adviser, Pig Branch; "Poultry Breeding and Feeding," by F. N. J. Milne, Assistant Husbandry Officer; "Animal and Poultry Diseases—Causes and Remedies," by K. M. Grant, Veterinary Officer.

Dairying.—"Herd Production and Recording," by S. E. Pegg, Senior Dairy Adviser (Herd Testing); "Milking Machines and Separators," by E. Sutherland, Dairy Adviser (Machinery).

Plate 117.

JUNIOR FARMERS LEARNING THE "HOW" AND "WHY" OF MACHINERY OPERATION.

In the evening sessions, documentary films covering a wide range of rural interest and education were screened and the theme of each motion picture formed the subject of subsequent discussion.

Although wet weather upset arrangements for some field demonstrations, the first school of instruction for junior farmers was a complete success, and as the Junior Farmers' Club Movement extends many similar schools will be held.

Junior Farmers for Britain.

Three members of Junior Farm Clubs are on their way to England on the R.M.S. "*Orion*" to compete in the International Stock Judging Competition at this year's Royal Show to be held at York. The boys are Ken. Henry, of the Numbaa Junior Farmers' Club, Nowra (New South Wales); Jack Martin, of the Albion Park Junior Farmers' Club (New South Wales); and Allan Turner, of the Kiewa Valley Junior Farmers' Club (Victoria). These boys were selected from a large number of nominations from many parts of the Southern States where the Junior Farmers' Club organisation is now firmly established. Next year it is hoped that Queensland will be represented among the junior farmers selected to travel abroad on similar educational tours.

Plate 118.
LEARNING THE POINTS OF A GOOD HORSE.

Plate 119.
HOW OLD IS HE? Junior farmers getting the tip right from the horse's mouth.

MARKETING

Production Trends—April.

Dairy cattle are in good condition and production generally is being well maintained. As a result of cooler weather, the quality of milk and cream supplies is improving.

Sowing of wheat, barley and oats is proceeding on the Darling Downs.

Late planted crops of maize and grain sorghum are still being harvested.

A heavy sugar crop is in prospect in the far north, where showery conditions throughout April were sufficient to keep crops growing, and provided excellent planting conditions. Conditions are also good in the Mackay district, where crops are expected to be better than for several preceding years.

Harvesting of the cotton crop continued during April until interrupted by heavy rains towards the end of the month. The Rust mechanical picker is at present operating in the South Burnett, and reports indicate very satisfactory results.

With the exception of falls experienced in the northern and southern coastal sectors towards the latter end of April, dry conditions prevailed throughout the pastoral areas. Feed generally is dry, and in some areas extremely scarce, whilst surface waters are rapidly disappearing.

Sugar Prices.

The Acting Minister for Agriculture and Stock, Mr. D. A. Gledson, stated recently that he had received from the Sugar Board a declaration made in accordance with clause 10 of the Proclamation of 12th June, 1947, that the proportion of 1947 season Queensland sugar deemed to have been delivered for home consumption was 85.8132 per cent. of the production, exclusive of "excess" sugar, and that the net value of surplus sugar was determined at £29 12s. 6d. per ton 94 net titre. In respect to home consumption sugar under clause 8 of the Proclamation the price had been declared at £24 per ton 94 net titre.

The average price represented by the foregoing is £24 16s. per ton for sugar within the peak. The final payment is to be made on 31st May for sugar delivered by that date; and payment will be made as soon as possible after delivery in respect to the balance of the sugar.

Mr. Gledson said that the expenses of the Sugar Board in marketing sugar are expected to increase very considerably for the 1948 season, because of sharply increased jute prices and the general disturbed conditions and rising costs.

Protracted delays in the transport of sugar from Queensland ports to refineries cause considerable loss, because of the deterioration of the sugar and the bags, extra handling costs, and refining difficulties.

Brisbane Wholesale Markets.

April saw the peak of the marketing of apples, pears and grapes from the Granite Belt. By the end of the month consignments to Brisbane had declined appreciably. The general quality of these fruits was good and growers found a favourable market.

Quantities of bananas and pineapples marketed were much below those of recent months. Wholesale prices advanced.

There was a good demand for lucerne chaff from local and near country districts and average prices for the month were high at approximately £12 per ton. The settlement of the rail strike allowed consignments to be made to more distant areas. For this latter purpose up to £17 per ton was paid for some lines of prime dry green leafy lucerne chaff.

Potato Marketing.

The meeting of the Federal Potato Advisory Committee in Brisbane on 29th April gave representatives from each State the opportunity to go to work on the marketing problems which will face the industry when "The National Security (Potatoes) Regulations" are revoked on 31st October next.

The main difficulty is that in two States, Tasmania and South Australia, no complete legislative framework yet exists on which statutory Potato Marketing Boards could be built. Added to this is the lack of concurrence among the States on the question of the regulation of acreage.

However, there was a general feeling at the meeting that members had come much nearer to a common view point, and the Committee unanimously approved a plan which it considered would implement the orderly marketing of potatoes after Commonwealth control has ceased. If this plan is adopted by all the States Organisations it will be presented to the Minister for Commerce and Agriculture for his consideration.

Proposed Tobacco Leaf Marketing Board.

The Minister for Agriculture and Stock, Mr. H. H. Collins, has announced that there would be no referendum on the question as to whether the *Primary Producers' Organisation and Marketing Acts* would be extended to tobacco leaf, and a tobacco leaf marketing Board set up accordingly. Objections lodged at the Department did not conform with the requirements of the Act for a ballot since they did not contain the requisite number of names of registered tobacco-growers.

The following nominations of candidates for election as growers' representatives on the Board have been received by the Returning Officer:—

District No. 1 (Northern)—

Gilmore, Thomas Vernon, Emerald Creek, Mareeba.
Short, Edgar Harry, Dimbulah.

District No. 2 (Southern)—

Doljanin, Ivon, Whetstone.
Donges, Jacob, Glenarbon, Yelarbon.
Golding, Francis Robert Eldridge, Miriam Vale.
Mayne, Walter Herbert, Colburn, Texas.
Power, John Lawrence, Stanley street, South Brisbane.
Ziviani, Renzo, Inglewood.

As two growers' representatives are to be elected from each of the two districts, Messrs. Gilmore and Short have been elected unopposed for District No. 1.

An election will be necessary for District No. 2. Ballot-papers have been despatched to growers on the roll for that District; the election will be held on the 13th July.

QUEENSLAND SHOW DATES, 1948.

Bowen	June 30–July 1	Lawnton	July 30–31
Brisbane R.N.A.	August 7–14	Lowood	June 11–12, 14
Cairns	July 20–22	Mackay	June 22–24
Cooroy	August 28	Malanda	September 3–4
Gatton	July 15–17	Nambour	July 1–3
Gladstone	June 10–12	Proserpine	June 25–26
Ingham	July 16–17	Rockhampton	June 16–19
Innisfail	July 30–31	Rosewood	July 9–10
Laidley	June 25–26	Toogoolawah	June 18–19
		Townsville	July 6–8

GENERAL NOTES

Bureau of Sugar Experiment Stations.

Mr. N. J. King, Assistant Director in the Bureau of Sugar Experiment Stations, Department of Agriculture and Stock, has been appointed to the position of Director of Sugar Experiment Stations which became vacant recently on the resignation of Mr. E. R. Behne.

Mr. L. G. Vallance, Senior Soils Technologist in the Bureau, succeeds Mr. King as Assistant Director of Sugar Experiment Stations. Mr. Vallance will go abroad shortly, where he will study methods being used in overseas countries, particularly in the tropics and sub-tropical countries, to arrest decline in soil fertility.

Queensland-British Food Corporation.

Following the secondment of Mr. C. J. McKeon, Director of Agriculture in the Department of Agriculture and Stock, to the Queensland-British Food Corporation, the Department's Assistant Director of Agriculture, Mr. D. O. Atherton, will act as Director of Agriculture during Mr. McKeon's term with the Corporation.

Banana Industry Protection Board.

Mr. N. E. H. Caldwell, Assistant Director of Horticulture, Department of Agriculture and Stock, will succeed Dr. W. A. T. Summerville (Director, Division of Plant Industry) as a representative of the Government and Chairman of The Banana Industry Protection Board.

Open Season for Duck and Quail.

Following the decision of the Government to declare an open season for duck and quail in Queensland this year, an Order in Council has been issued under *The Fauna Protection Act of* 1937 declaring an open season for wild duck (except Burdekin duck) and quail for the period from 1st July, 1948, to 30th September, 1948. This year the open season will apply throughout the State for the three months abovementioned.

The attention of shooters is drawn to an *Order in Council* which prescribes that twenty duck and twenty-five quail are the maximum numbers, respectively, which any one person may take during a period of twenty-four hours.

The Poultry Advisory Board.

The Executive Council, in pursuance of the provisions of *The Poultry Industry Act of* 1946, has approved of the constitution of the Poultry Advisory Board until 31st December, 1948. Hon. H. H. Collins, Minister for Agriculture and Stock, is Chairman of the Board, and Messrs. W. Webster, Director of the Division of Animal Industry, and P. Rumball, Officer in Charge of the Poultry Branch, represent the Department of Agriculture and Stock. In addition, the four representatives of the poultry industry are Messrs. R. B. Corbett, Chairman of the Egg Marketing Board, C. Kidd, Poultry Farmers' Co-operative Society, D. Anderson, National Utility Poultry Breeders' Association, and R. F. Phyall, Poultry Farmers' Union.

Soil Conservation Conference for Queensland.

The Minister for Agriculture (Hon. H. H. Collins) has announced that a conference of soil conservationists will be held in Brisbane on 28th May. It is expected that the conference will be attended by delegates from all States and the Commonwealth.

Mr. Collins said that his Department would take advantage of the presence of these experts in Queensland and had arranged a pre-conference visit to the Darling Downs and Burnett districts. Delegates would see the special problems of soil erosion in Queensland and the methods being developed to combat this menace, and their opinions on these methods would be freely sought. He added that while soil erosion had not reached the serious stage encountered in some other States, the menace was serious and must be faced.

Rural Topics

Fertilizer Buyers Protected.

Buyers of fertilizer for farm and home garden use are fully protected in Queensland, in so far as quality is concerned, by the Department of Agriculture and Stock. It is mandatory under the Fertilizers Act which is administered by the Department for a label to be attached to each package of fertilizer showing the percentage of each chemical it contains and the degree of fineness of the ingredients. Samples are selected periodically by inspectors and analysed so that a proper check can be maintained.

Fertilizers commonly used in Queensland are nitrate of soda from Chile; sulphate of ammonia, a by-product of gasworks and coke ovens (also manufactured by the fixation of nitrogen from the air, and often referred to as synthetic nitrogen); superphosphate, manufactured in Brisbane from Ocean and Nauru Island rock phosphate; dried blood and bone dust, meatworks by-products; sulphate of potash from Western Australia; and muriate of potash from Palestine and France.

Low Butterfat Tests in Milk.

At this time of the year many dairy farmers have difficulty with the fat test of their bulk milk. In many cases the test is below the minimum standard of 3.3 per cent.

The following recommendation, if applied, will bring about an improvement:—

1. Arrange milking intervals as near to 13 and 11 hours as possible.
2. Do not strip at the evening milking, but strip thoroughly at the morning milking.
3. Reject fore-milk from each quarter and carefully examine for mastitis.
4. Prevent water from entering milk when cleansing milking machines.
5. Keep stock in good condition by adequate feeding.
6. Milk heaviest producers last in the evening and first in the morning.
7. Feed calves with milk from freshest cows.
8. Continue to milk strippers and include their milk in the bulk.
9. Remove teat cups immediately after milk has been extracted.

These recommendations can be put into practice immediately. Many dairy farmers, in addition, are including a percentage of cows of the higher testing breeds in their herds and arranging for better spacing of calving. Herd testing also would lead to the elimination of inherently low testing stock.

Liquid Manure.

To make liquid manure, soak a sugar bag of fresh poultry, cow, or pig manure for a week in a cask with the head knocked in—one holding 40 to 50 gallons is the most handy. Use the resulting solution at the rate of one part to three parts of fresh water. Fill the cask again, and when the manure has soaked for a week use the solution at the rate of one part to one part of fresh water. The cask may then be filled up a third time, and after the liquid has been allowed to stand for a week it may be used neat.

This form of liquid manure is safe, and if it is applied weekly at the rate of 4 gallons to every 18 feet of a running row no further stimulant is necessary for most growing crops.

Many crops, such as lettuce, cabbage, and silver beet, will be more tender for being forced by applications of liquid manure.

GADGETS AND WRINKLES

Quarter-Twist Belt Drive.

By J. H. NICKLIN.*

OCCASIONALLY a grower who wants to install some power-driven machinery, such as an emery wheel or circular saw, finds that the layout of his engine is such that the new machine can only be placed in some position where it would be in his way, if driven by the usual belt drive from his power unit.

The quarter-twist belt drive would solve his problem in many cases by giving him further choice of sites for the new machine, and for this reason we now present particulars of this drive which is both simple and effective.

An example of the quarter-twist drive is to be seen at the Sugar Experiment Station, Mackay, where it was installed on a counter shaft which, driven by the irrigation engine, drives a small sampling mill, cane fibrator, and emery wheel. This installation permitted the three machines to be put into a small narrow shed without congesting the floor space, and has operated quite satisfactorily for more than ten years.

The important condition that must be satisfied with this type of drive is that the centre of the face of each pulley must be aligned with that face of the other pulley from which the belt leaves. When, with a vertical belt drive, a plumb line is hung over the falling side of the overhead pulley at the middle of its face, the line must touch the rising side of the lower pulley at the middle of its face.

Actually, of course, the drive need not be a quarter twist. So long as the condition mentioned is carried out the angle between the two pulleys may be anything from 0 degrees to 180 degrees.

In laying out the drive the only point to be watched is that, when looking down on the tops of the two pulleys, the arrow of direction of the top pulley must follow the arrow of direction of the lower pulley. The drawing shows the application of this rule to the four possible cases. In each case it must be understood that the belt passes over the top of the overhead pulley and thence to the far side of the pulley underneath.

Another example of this type of drive is an engine or horizontal electric motor belted to a vertical spindle pump.

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* In the *Cane Growers' Quarterly Bulletin* (Bur. Sug. Expt. Stns., Dept. Agric. & Stk., Q.) for January, 1948.

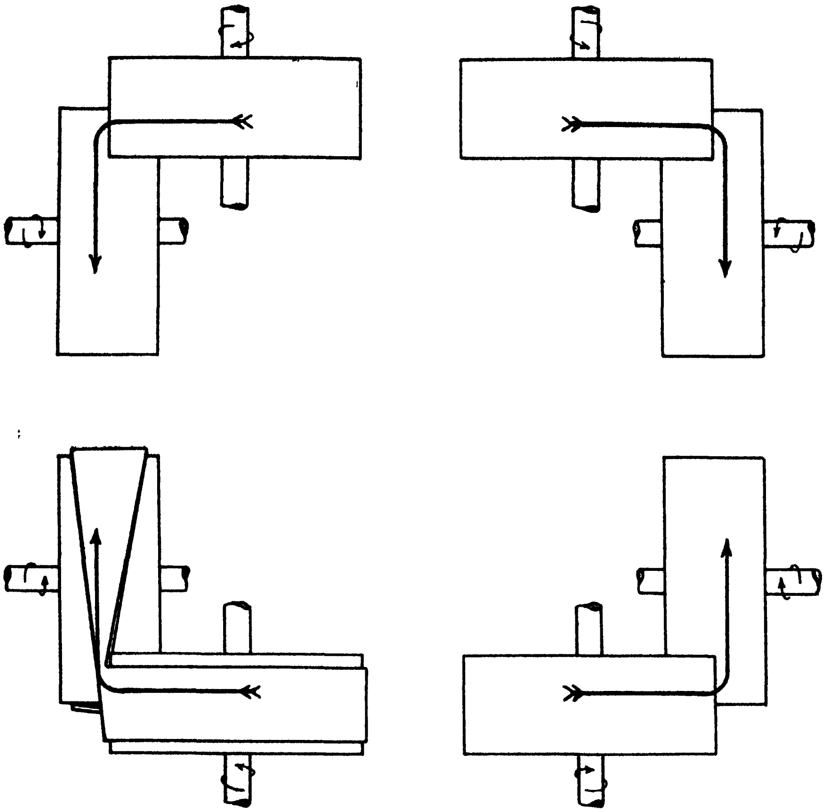


Plate 120.—FOUR POSSIBLE CASES OF THE QUARTER-TWIST BELT DRIVE.

For a satisfactory drive the following points could be kept in mind—

1. The distance between the faces of the pulleys should be at least eight times the width of the belt.
2. Thin flexible belts are desirable.
3. Pulleys of about the same diameter give best results.
4. The drive is not reversible.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

PARENTS MUST BE THE FAMILY'S HEALTH OFFICERS.

MOTHERS and fathers are in the first line of defence against their children catching infectious diseases. Governments, both State and Municipal, may supply all kinds of services by which the health of their citizens can be protected, but without the intelligent co-operation of parents it is impossible to build up a really healthy population.

Now that autumn is here and cold winter days just round the corner, we expect the usual crop of colds, whooping cough, measles and other "catching" illnesses. Shall we get together and see whether we can keep the children from becoming infected?

The first step in preventing disease is to understand what causes it. The two common types of disease among babies and young children and which cause not only a great number of deaths, but also of chronic ill health are (1) respiratory infections in which the disease germs live in the secretions of the mouth, nose, throat and air passages and are carried from person to person by coughing, sneezing, and in the case of very small children by putting their fingers in their mouths and smearing other children's hands or clothes; and (2) bowel infections in which the disease germs can be found in babies' napkins, closet pans, manure and garbage heaps or similar places and are conveyed to food by unwashed hands, or flies, cockroaches and other vermin.

Remember that disease germs are living organisms, and although they are too small to be seen without the aid of a powerful microscope they are very dangerous, especially in large numbers. They multiply very rapidly in any warm, moist medium, sometimes just by the simple process of dividing themselves in two; so that it is possible for baby's food, for instance, if carelessly handled, to grow millions of harmful germs in quite a short time.

Nature does her best to prevent us from becoming ill by providing in our blood-stream certain cells which are capable of destroying the germs of disease. Provided there are not too many of them and the body is in a healthy state, Nature's system works.

In the case of some serious infections, doctors can now assist Nature by injecting a very small number of germs which have been killed beforehand into the bloodstream and so increasing the number of our "fighting cells." This is called immunisation or inoculation, and the men and women in the armed forces during the war were all protected against disease in this way.

So parents can help to keep their children well by the following methods:—

(1) Building up the children's general resistance, so that although they may come into contact with infection they will not easily become ill. This can be done by giving the right kind of food, keeping the children in the fresh air and sunshine, and giving them plenty of rest and sleep.

(2) Keeping them away from sick people and out of crowded buildings, where there may be many people who are carrying disease germs.

(3) By having them immunised against disease where this is possible, as in the case of diphtheria, whooping cough, tetanus, &c.

(4) By keeping the house and all its surroundings clean, and keeping closet pans and rubbish tins closed. By protecting food from flies and cockroaches.

(5) By putting baby's soiled napkins into a bucket of water as soon as removed; and by always washing the hands well before handling food of any kind and after changing baby or handling a sick child.

(6) By not allowing anyone to kiss children on the mouths, and by teaching children clean habits. All the family should learn to hold a handkerchief before the mouth and nose when coughing or sneezing.

Any further advice on this and other matters about the care of children may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau,* 184 *St. Paul's Terrace, Brisbane,* or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

Cold Weather Cookery.

Potato Pastry.

Ingredients: ½ lb. cold sieved potatoes, ½ lb. flour, 1 teaspoon baking powder, 3 oz. butter, pinch of salt.

Cut the shortening into flour. Rub with finger tips until like fine bread crumbs. Add the baking powder and mix in potatoes. Add sufficient cold water to make a stiff dough. Roll out and use as required.

This pastry may be used for sweet or savoury dishes.

Steak and Potato Pie.

Ingredients: 8 oz. onion, ½ oz. cooking fat or dripping, 3 tablespoons flour, ½ pint water, 1 lb. cooked stewing steak, 1 tin peas (8 oz. size), 1 to 2 teaspoons salt, ¼ teaspoon pepper, 2 lb. potatoes, cooked and mashed.

Slice the onion thinly and fry gently in the fat until tender; work in the flour. Add the water gradually and bring to the boil, stirring all the time; boil for 5 minutes. Add the steak, peas and seasoning and mix well. Place the mixture in a piedish, cover with the mashed potato and brown under the grill or in a hot oven.

Dumplings.

Ingredients: 1½ lb. mashed potato, 6 tablespoons flour, 1 egg.

Mix all ingredients together, knead the dough until smooth and pliable, and form into small oblong dumplings, dipping the hands in flour while shaping them. Drop the dumplings in boiling salted water. The dumplings are cooked when they rise to the top and float in the boiling water. Drain and serve hot.

These dumplings can be used as a sweet with syrup, fruit or jam, or with the stew.

QUEENSLAND WEATHER IN APRIL.

The patchy to very poor rainfall distribution of the first three months of the year continued during April over most of the State. A succession of moderate falls in the Peninsula districts during the first half of the month resulted in over average aggregate figures in most of those areas and flood rains over the south coast districts on the 30th brought 3 to 5-inch aggregates 29 per cent. above normal in the Moreton and 32 per cent. Port Curtis sections. The unsettled weather continued during the first two or three days of May with the beneficial rain area spreading over considerable portions of the central coast east. The rain spread inland to the Central Highlands but, although 1 to 2-inch falls were reported from several stations, benefits were too light and patchy in most localities. In the Central Lowlands very isolated falls only were registered (Muttaburra, however, registered 270 points) Far better general results, however, were recorded in the Downs and Maranoa. Many stations reported 1½ to 3 inches and over, while parts of the Warrego received moderate totals. As a result of the May rains, Downs and South Coast farming and dairying districts should commence the winter season with good cultivation and pasture conditions. Relief was also opportune in the central coast sugar lands. In the southern border pastoral districts wintering prospects should range from fair to good, mainly owing to 3 to 6-inch rains in the south-west and southern border during February. Over the central interior and tropical interior pastoral areas most districts are approaching the normally dry winter and spring with marked seasonal rainfall discrepancies. An examination of the rainfall totals for the first four months of 1948 shows the Central Highlands with 70 per cent. below normal rain, Central Lowlands 67 per cent., Upper Western 58 per cent., Lower Western 50 per cent., Lower Carpentaria 47 per cent., and Upper Carpentaria 56 per cent. During the season no general tropical rain movement penetrated through the north-west of the State, and the occasional out of season rains of this type at a very early date are now urgently required.

Floods.—Local flood and stream rise conditions commenced in the south coast on the 30th, particularly in the Mary River area, where some heavy 24-hour totals in the catchment area included 1,427 points at Miva and 10 inches at Theebine. By the 3rd May most coastal districts from the border north to Mackay had experienced traffic difficulties, &c.

Temperatures.—Mean maximum temperatures were mostly round above normal, with chief departures of 1.3 deg below at Cairns and 1.2 deg. at Thargomindah, Georgetown and Palmerville, however, were 2.2 deg. and 3.0 deg. above respectively. Minimum temperatures were also about normal, ranging from 0.9 deg above at Palmerville and Georgetown to 1.3 deg. below at Thargomindah.

Frosts.—The main frost period was from the 15th to the 20th and on the 24th and 25th—Kingaroy, 7 nights; Stanthorpe, 6. Grass minimum, 22 deg. on 24th at Bybera, Stanthorpe and Kingaroy, 23 deg. on 24th.

Brisbane.—Mean pressure 30.023 ins. (normal 30.038 ins.). Temperature.—Mean maximum 76.8 deg. (normal 78.8 deg.) ; mean minimum 59.9 deg. (normal 61.4 deg.) ; mean temperature 68.3 deg. (normal 70.1 deg.). Highest daily reading 86.8 deg. on 21st; lowest 51.7 deg. on 29th. Rainfall—415 points on 12 days (average, 467 points on 12 days). Wind.—Gust westerly 50 miles per hour on 15th.

Rain position is summarised below :—

Divisions.	Normal Mean.	Mean April, 1948.	Departure from Normal.
	Points.	Points.	Per. Cent
Peninsula North	659	930	41 above
Peninsula South	164	314	91 „
Lower Carpentaria	101	5	95 below
Upper Carpentaria	115	..	100 „
North Coast, Barron	788	256	68 „
North Coast, Herbert	822	325	60 „
Central Coast, East	288	160	44 „
Central Coast, West	145	25	83 „
Central Highlands	150	30	80 „
Central Lowlands	121	2	98 „
Upper Western	57	..	100 „
Lower Western	80	..	100 „
South Coast, Port Curtis	249	329	32 above
South Coast, Moreton	416	535	29 „
Darling Downs, East	161	77	52 below
Darling Downs, West	119	87	27 „
Maranoa	129	22	83 „
Warrego	110	20	82 „
Far South-West	86	..	100 „

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

JUNE.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			Minutes Later than Brisbane at Other Places.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.00	Cairns ..	8	50	Longreach	26	43
6	6.32	5.00	Charleville	25	29	Quilpie	37	33
11	6 34	4.59	Cloncurry . .	36	63	Rockhampton ..	1	19
16	6.36	5.00	Cunnamulla ..	31	27	Roma	15	19
21	6.38	5.00	Dirranbandi .	22	16	Townsville.. ..	8	42
26	6 39	5.2	Emerald	11	28	Winton . ..	29	52
30	6.39	5.3	Hughenden ..	21	49	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	a.m.	p.m.
1	12.12	1.05
2	1.05	1.33
3	1.59	2.02
4	2.54	2.33
5	3.53	3.08
6	4.54	3.47
7	5.59	4.34
8	7.06	5.29
9	8.11	6.31
10	9.12	7.39
11	10.05	8.48
12	10.52	9.56
13	11.32	11.02
	p.m.	
14	12.08	..
		a.m.
15	12.42	12.05
16	1.14	1.07
17	1.48	2.08
18	2.24	3.09
19	3.03	4.11
20	3.47	5.12
21	4.35	6.12
22	5.28	7.09
23	6.23	8.02
24	7.19	8.48
25	8.16	9.28
26	9.11	10.04
27	10.04	10.36
28	10.56	11.05
29	11.49	11.34
		p.m.
30	..	12.02

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS)

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	23	17	39	32	14	8	44	37
6	13	27	28	43	2	18	31	51
11	11	28	26	43	0	19	28	51
16	21	15	38	31	12	7	43	35
21	30	9	46	24	21	0	53	26
26	25	13	42	28	16	3	48	31
30	17	20	32	36	8	11	21	42

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS)

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	37	24	55	46	40	31	31	21
3	28	33	50	54	34	38	24	26
5	17	43	41	59	26	45	15	36
7	8	52	36	65	21	50	8	44
9	3	55	34	67	18	52	4	45
11	7	49	36	63	20	49	7	41
13	18	38	42	57	27	42	16	33
15	28	27	50	48	34	33	24	23
17	40	15	57	41	42	26	33	14
19	48	6	63	34	48	20	40	7
21	55	3	68	32	51	18	45	4
23	54	5	67	34	51	20	44	6
25	43	12	60	38	45	24	36	12
27	39	17	56	42	41	27	33	16
29	30	26	51	47	35	33	25	22
30	24	31	46	52	31	37	21	27

Phases of the Moon.—New Moon, June 7th, 10.55 p.m.; First Quarter, June 14th, 3.40 p.m.; Full Moon, June 21, 10.54 p.m.; Last Quarter, June 30th, 1.23 a.m.

On June 21st, at 10 p.m., the Sun will reach its greatest angle north of the equator and will then rise 26 degrees north of east and set 26 degrees north of west.

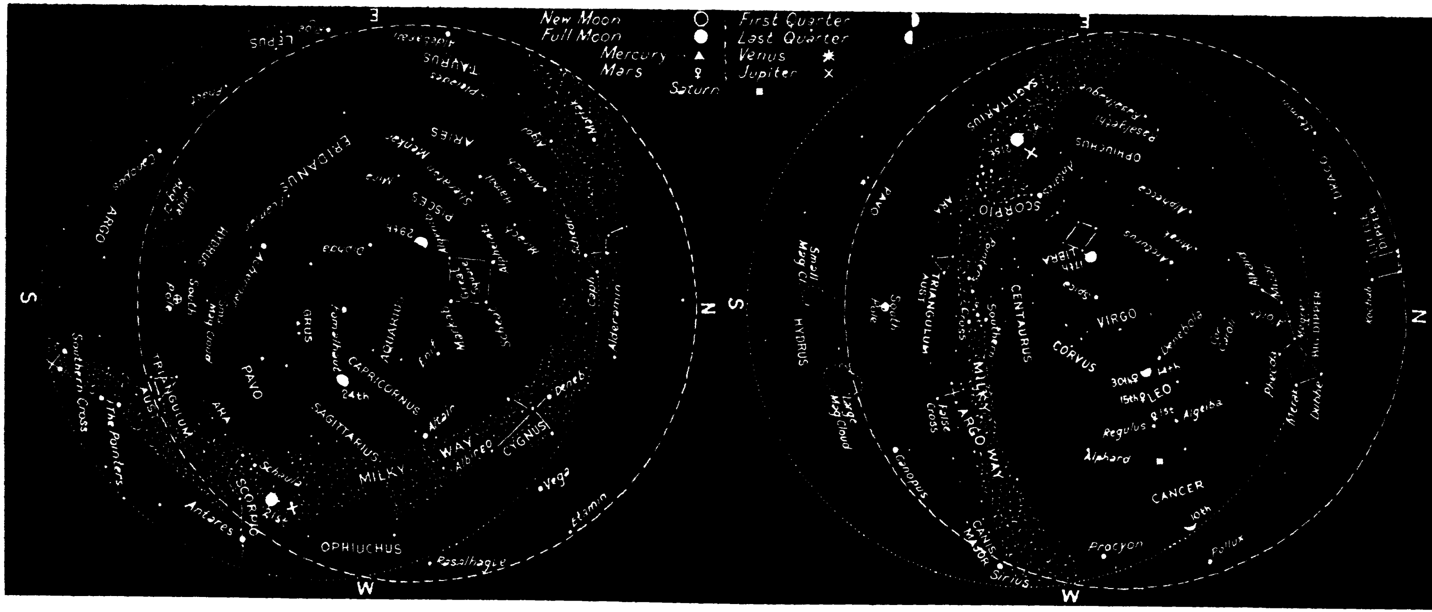
Mercury.—At the beginning of the month will be an evening object and will set about 1 hour and a-quarter after the Sun. It will reach inferior conjunction with the Sun on June 24th, after which it will pass into the morning sky, and by the end of the month will rise ¾ hour before the Sun.

Venus.—Will be visible low in the west during evening twilight at the beginning of June, when it will set 2 hours after the Sun, but by the 24th it will be in line with the Sun and will then pass into the morning sky. At the end of the month it will rise about ¾ hour before the sunrise.

Mars.—Still in the constellation of Leo, at the beginning of June will set at midnight, and by the 30th will set from 10.45 p.m. in south-east Queensland to midnight in western Queensland.

Jupiter.—In the constellation of Ophiuchus, will be opposite the Sun on the 15th, and consequently this month Jupiter will be visible all night, rising at sunset and setting near sunrise.

Saturn.—In the constellation of Leo, on the 1st will set between 9.45 p.m. and 11 p.m., and by the 30th will set between 8.15 p.m. and 9.15 p.m.



Star Charts.—The chart on the right is for 7.15 p m in the so th-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th June. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 10 hours later. On each chart the dashed circle is the horizon as viewed from Cape York, and the dotted circle is the horizon for places along the N.S.W. border. When facing north hold "N" at the bottom, when facing south hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th, and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

APRIL RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of years' records.	April, 1947.	April, 1948.
	In.		In.	In.
North Coast.				
Atherton	4·42	42	2·00	3·19
Cairns	11·23	61	4·42	3·10
Cardwell	8·78	71	1·46	2·49
Cooktown	8·69	67	0·93	2·71
Herberton	3·73	57	0·87	1·86
Ingham	7·64	51	0·68	3·55
Innisfail	20·21	62	4·18	10·04
Mossman	7·41	19	3·41	5·07
Townsville	3·29	72	0·01	0·19
Central Coast.				
Ayr	2·77	56	..	1·03
Bowen	2·91	72	0·29	2·07
Charters Towers ..	1·54	61	..	..
Mackay	6·31	72	0.99	2·53
Proserpine	6·11	40	1·21	6·33
St. Lawrence ..	2·73	72	0·79	1·82
Central Highlands.				
Clermont	1·64	47	..	..
Springsure	1·56	74	0·21	0·55
South Coast.				
Biggenden	2·15	44	5·16	3·17
Bundaberg	3·25	60	1·99	5·28
Brisbane Bureau ..	3·71	95	6·54	4·15

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of years' records.	April, 1947.	April, 1948.
South Coast—contd.	In.		In.	In.
Caboolture	4·48	67	2·94	4·83
Childers	2·85	48	3·74	3·65
Crohamhurst.. ..	6·68	50	5·18	9·69
Esk	2·89	56	2·06	3·00
Gatton College ..	1·86	44	1·70	1·65
Gayndah	1·46	72	5·42	3·22
Gympie	3·43	73	4·66	7·81
Kilkivan	2·20	62	4·44	6·03
Maryborough ..	3·81	72	6·75	4·81
Nambour	6·13	47	6·21	8·32
Nanango	1·93	61	3·45	1·40
Rockhampton ..	2·53	72	0·44	2·37
Woodford	4·52	55	2·32	7·26
Darling Downs.				
Dalby..	1·39	73	0·88	0·41
Emu Vale	1·32	47	2·18	0·38
Jimbour	1·42	64	1·48	0·52
Miles	1·43	58	0·35	1·04
Stanthorpe	1·70	70	3·35	0·65
Toowoomba	2·56	71	2·11	1·70
Warwick	1·60	78	1·64	0·47
Maranoa.				
Roma	1·28	69	..	0·20
St. George	1·29	62	0·42	0·15

CLIMATOLOGICAL DATA FOR APRIL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	84	71	89	7	64	24	310	15
Herberton	..	78	60	87	22	47	24	186	12
Townsville	..	85	69	91	15	59	25	19	3
Rockhampton	30·03	83	61	93	21, 22	46	16	237	6
Brisbane	30·07	77	60	87	21	52	20	415	12
Darling Downs.									
Dalby	..	78	51	88	21	34	24	41	4
Stanthorpe	..	68	45	79	20	26	24	65	5
Toowoomba	..	72	50	82	21	33	24	170	9
Mid-Interior.									
Georgetown	29·93	92	67	97	25	52	24	..	..
Longreach	30·04	88	61	99	2	46	16, 24, 25	..	..
Mitchell	30·05	80	51	91	20	34	24	8	1
Western.									
Burketown	..	91	67	97	22	55	24	..	..
Boulia	29·97	88	62	101	2	49	16	..	..
Thargomindah	30·04	81	57	94	2, 1	45	26	..	..

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane

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11

Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Arts, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Queensland Cattle Country.

REVIEWING the status and prospects of the Queensland beef industry recently, the Minister for Agriculture and Stock, Hon. H. H. Collins, said:—

The larger portion of Queensland may be regarded as cattle country suitable for either breeding or fattening. Approximately half the cattle in the Commonwealth are run in this area. The cattle country may be divided for convenient description into Coastal, Gulf and Western regions. The coastal areas are those along the east coast, including the Cape York peninsula and extending 250 miles inland; the Gulf country extends inland from the shores of the Gulf of Carpentaria; and the Western country includes the fringe of the Barkley Tablelands and the Cooper Channel country.

From the cattle lands of Queensland travel most of the stores fattened in the southern States. From the central coastal portion of Queensland are marketed most of the fat cattle slaughtered in Queensland for home consumption and export.

The progress of the beef industry towards full development obviously depends on several factors, including breeding, feeding and the extent to which science is applied to it. It is generally accepted, however, that production in the beef industry can be increased and perhaps doubled.

The breeder has done his job and has done it well. The large herds of the different British breeds in Queensland and in other States of the Commonwealth are proof of the soundness of the service of the breeder to the grazing industry. To the pioneers of that industry who

laid its firm foundations, and to their successors who are carrying on the good work, we acknowledge our debt. By appraising the cattle raising potential of the country by introducing foundation stock from the proved cattle families of Britain, and by assuring a regular infusion of new blood, the cattle breeders of Australia have done great work in the national interest.

The best bred cattle, however, cannot be grown into prime beef unless they are well fed and improved methods of husbandry must be evolved to assure that a regular supply of suitable fodder is available at all times to enable a steady supply of young prime carcases to be marketed from this State.

Such improved methods are only acceptable if economically sound and assure a margin of profit to the producer.

The processing side of the industry has progressed remarkably during recent years. After considerable scientific investigation and experimentation, chilled beef from Queensland was marketed in the United Kingdom in 1934. This was an outstanding achievement and is a milestone in the progress of the Queensland cattle industry. Chilled beef, however, must be produced from prime young high quality cattle and the comparatively small number of the cattle available must be increased in order that a steady flow of beef of this type can be sent to overseas markets.

It would appear that increased production can be brought about by short and long term planning.

In the coastal area, where most of the prime cattle are produced at the present time, production could be stepped up by the provision of additional water, by pasture improvement, and extension of the crop fattening at present being practised in some districts.

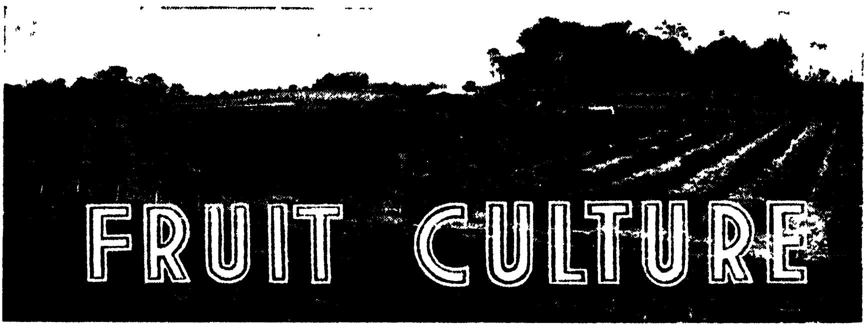
On a long range plan, improvement of watering facilities and irrigation, extension of railways into inland areas, such as the Channel region, pasture experiments on summer rainfall country, feeding trials with legumes and grasses which will grow in such country, and crop and grain feeding experiments in districts where fattening of this type is being done at present, will all help to increase production.

The Queensland Department of Agriculture and Stock has for some time been conducting palatability trials with grasses and legumes in rain forest country and is now arranging feeding trials with these pastures.

Similar trials are being arranged under irrigation to be ready for the proposed irrigation schemes.

Recently, a Cattle Husbandry Branch was formed and a special staff is being trained to assist the cattle industries to greater production. The State staff, in collaboration with officers from other States and the Council for Scientific and Industrial Research, is arranging long and short term experiments in a real effort to increase production by economic pasture improvement or crop and grain feeding.

With improved practices in animal husbandry, proper utilisation of our grazing lands, scientific research, particularly in respect of animal nutrition, pasture improvement, crop feeding, fodder cultivation and conservation, who can doubt the future of the cattle industry of Queensland?



Passion Fruit Growing in Southern Queensland.

J. M. WILLS, Adviser, Horticulture Branch.

THERE is no reason why passion fruit growing should not again develop into an industry of considerable importance in southern Queensland. Prior to 1940 extensive plantings had been made on the plateau country of the MacPherson Range, but, owing to the wartime scarcity of labour and material, most of the plantations went out of production and very few new plantings were made. The vine is quite at home on the South Coast and in the higher rainfall areas of the sub-tropical coastal districts generally, where it makes vigorous growth and produces good crops. The fruit is in constant demand on the fresh-fruit market and for inclusion in canned tropical fruit salads, fruit drinks, and confectionery.

Though there are a number of varieties in existence in the State, only one—the purple-fruited *Passiflora edulis*—is grown commercially.

In some parts of southern Queensland, hitherto regarded as essentially banana-growing and dairying districts, there is little virgin land left for banana-growing. Old plantations usually carry a good cover of grass, but at times, because of altitude and inaccessibility to dairy stock, they are unsuitable as grazing areas. On such areas, which otherwise may remain unused, the planting of passion fruit has proved payable.

The passion vine is a vigorous and adaptable plant, but it does not follow that because of this plantings may be made at random and the vines allowed to grow without care. On the contrary, considerable attention is necessary in order to obtain the best results, and disappointment is the usual result of "hit or miss" methods of cultivation.

The prospective grower is advised to commence with a small area, which may be afterwards increased; 4 to 5 acres of vines is generally the maximum area one man can cultivate and attend to, if horse-drawn or mechanically-driven cultivators are used, though more labour will be necessary for harvesting and packing. On less accessible sites, where hand-cultivation is the only practicable method, the area should be substantially less for efficient working; in such circumstances, 2 or 3 acres will be found quite large enough to occupy the full time of the grower.

CLIMATIC CONDITIONS.

The southern Queensland coastal climate is very suitable for passion fruit growing, as the vine thrives under warm, humid conditions. Self-sown plants may commonly be found growing along the edges of rain-forest clearings, roads, and snigging tracks, where they establish themselves with remarkable ease and produce fruit in quantity and of good quality in competition with natural vegetation.

Under normal seasonal conditions, heavy rainfall assures sufficient soil moisture for most of the year for the maintenance of vigorous growth, the exception being perhaps in early spring. Attention to cultivation will usually offset most ill-effects of a dry spring, but where it is prolonged into a dry summer some defoliation and loss of fruit may be expected. Some growers have found passion fruit growing profitable enough to warrant the installation of an irrigation system.

In the south-eastern part of coastal Queensland, frosts occur on flat and low-lying land, but severe frosts are rare on hillside country. When deciding to grow passion fruit, this fact should be kept in view. Light frosts will do little harm to the vines but a severe cold snap will kill the young top growth and may destroy the vines completely.

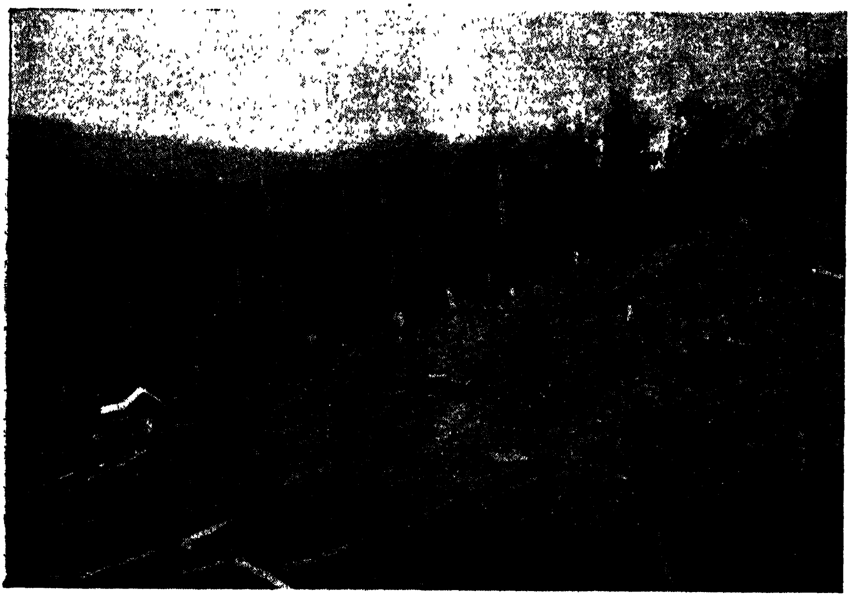


Plate 121.
A ONE-TIME BANANA PLANTATION TRELLISED FOR PASSION FRUIT VINES.

CROPPING HABIT.

Each crop is borne on new growth. The time which elapses between planting and first fruiting varies considerably and depends chiefly on the time of planting and the strength and vigor of the vines. Vigorous plants commence to bear earlier than less robust ones, and may produce a few fruits at six months. Generally, however, vines planted in the early spring produce the first commercial crop in 12–15 months. When autumn planting is practised, a small crop may be borne the following summer or autumn and the first big crop 18–21 months after planting.

In favoured localities two crops are generally borne yearly—a main summer crop and a secondary winter crop. Approximately ten weeks elapse between the time of setting of the fruit and maturity. Blossoming occurs usually during August, September, and October for the summer crop, and during February and March for the winter crop. Marketing of the summer crop commences in October and may extend to January, with the heaviest pickings in November and December. The winter crop is usually harvested in May and June.

Plate 122.
A SIX-MONTHS OLD VINE SHOWING FIRST FRUIT.

More or less continuous growth occurs in some years when weather conditions are favourable, and this results in the production of flowers and fruit right through the year. Occasionally, definite intermediate crops are obtained. The most evident of these is harvested during the months of February and March, following a November and December

blossoming. These intermediate crops, though light, are usually very profitable, since they are marketed outside the periods of peak harvest. However, they are not normal and are often followed by light settings of fruit for the main crops.

At high altitudes of 1,500 to 2,000 feet above sea level, flowering and cropping habits vary very widely on individual plantations, being influenced by the immediate local conditions. In general there is a main summer crop, which matures later than that on lower lands, with a subsequent winter crop; but on some plantations there is continuous cropping and flowering all the year round. This is influenced to some extent by pruning and consequent forcing of new growth on which the flowers are borne. Other areas, which are exposed to cold winds or lack sufficient sunlight during the winter months, bear exceptionally late crops. On still other sites, the crops are matured very early, even before those on the low lands. Growers planting on such locations are fortunate in being able to harvest their fruit during a period when the market is in short supply, and when prices are consequently considerably higher than those prevailing during the period of peak harvests.

The profitable life of the vine is generally about four years when grown under proper cultural conditions. Maximum cropping is obtained with the second summer crop, following which the tendency is for the vines and the quality and appearance of the fruit to deteriorate.

SELECTION OF SITE FOR PLANTATION.

Six important factors should be considered in selecting a site for a passion fruit plantation—viz., aspect, elevation, shelter, soil, drainage, and accessibility.

Plate 123.

RISING GROUND ON ONE SIDE AND A SOLID BELT OF TIMBER PROVIDE GOOD PROTECTION FROM WINDS.

Aspect, Elevation, and Shelter.

Aspect, elevation, and shelter generally will go together, as a good aspect is often elevated above frost level and sheltered from heavy winds. The aspect for preference should be from east to north, open to the morning sun, and backed by rising ground or dense natural timber to protect it from westerly and southerly winds. An aspect from east to north is naturally warmer, and this fact has a marked influence on the early maturity of the vines and the production of large crops of high-grade fruit, which colour and ripen evenly and rapidly. The exposed tops of ridges should be avoided where the soil has washed; vines rarely do well when planted in such situations.

Soils.

Vines are not very exacting in respect to soils. Any which are reasonably fertile are usually quite suitable, but it is of the greatest importance that they be well drained. Stagnant water at the roots and sour soil conditions are fatal. Soils on which vines are at present growing successfully range from rich rain-forest to light scrub and forest soils. In the case of the firstmentioned, vines have a tendency to produce very heavy, rank foliage; this becomes rather a disadvantage, as extra work is entailed in keeping the growth within reasonable bounds and checking fungus diseases to which the vine is subject. Good scrub and forest lands produce vines of good average growth without the tendency to excessive foliage, while there is little, if any, difference in cropping propensities. Normally, dry, open forest soils do not possess as great an amount of humus as those of rain-forest origin, and after being cleared of the natural timber for two or three years it may be observed that they dry out rather too quickly. This can be rectified, and the ground made

Plate 124.

AN ESTABLISHED PASSION FRUIT VINEYARD.—This vineyard is situated at Springbrook on one of the numerous small, richly fertile plateaux of the MacPherson Range, bordering New South Wales in the south-eastern sector of Queensland.

to absorb and hold moisture better, by growing and turning in cover crops during the winter. In addition, the fertility and mechanical condition of the soil also will be improved.

In common with the banana, passion vines thrive on stony ground, and except that cultivation is made more difficult, the presence of surface stone is not undesirable. Moreover, it has the advantages that it minimises soil erosion on hillsides and assists in the retention of soil moisture and the maintenance of a higher soil temperature during winter. It is obvious that the latter is important in maintaining the vigour of the plants and inducing an earlier response to spring conditions.

Plate 125.
PREPARING HILLSIDE LAND BY HAND FOR PASSION FRUIT.

Drainage.

Throughout the coastal districts of southern Queensland there is a heavy yearly rainfall, but during normal wet seasons half the annual fall may be precipitated during two or three months, hence the need for a well-drained soil.

Elevated and sloping sites are usually drained sufficiently, but drains across the slope should be made at intervals to carry surface run-off and control soil washing. These cross or contour drains should be as short as conveniently possible to avoid the necessity for having to carry too much water, and should have but a very gradual fall into main drains provided at intervals. All main drains should be grassed as soon as practicable. Stones may be used if available to reduce the speed of run-off, thus preventing scouring of the drains during periods of heavy, continuous rain. By keeping the surface of the soil well broken up, absorption of rain is increased and the possibility of erosion is lessened.

Accessibility.

The method of cultivation will be decided by the site selected. Mechanical or horse-drawn implements are, of course, more economical, but necessitate the thorough cleaning of the land in the first instance. The presence of logs, stumps, and stones makes hand cultivation necessary, with a corresponding increase in the time and labour required.

When elevated sites are selected, the provision of a "flying-fox" or overhead wiring system will be found a great convenience for the quick and safe transport of fruit to the packing shed, and for this reason a suitable site for a shed should be found or provided. Instructions for the erection of a wiring system may be obtained on application to the Department of Agriculture and Stock, Brisbane. Where possible, the packing shed should be conveniently situated alongside a good road providing access at all times to a railway siding or main road. It should be borne in mind that daily despatch of fruit to market is desirable and that any disorganisation or delay in transport may result in loss.

Plate 126.
A YOUNG PASSION FRUIT VINEYARD ON RED-OAK SOIL AT MUDGEERABA.

PREPARATION OF THE LAND FOR PLANTING.

The land in which vines are to be planted should be well prepared in order that the young plants may establish themselves rapidly and develop a good root system which can traverse a greater area from which to draw available plant food. Where ploughing is possible, this should be well and deeply done, and the soil later worked down finely. On land which it is not possible to plough, the soil should be broken up with mattocks or steel-pronged forks. Preparation should be completed by the end of August so that any rain which falls will all be absorbed and the land will be in good condition for planting.

Coastal soils are known to be deficient in lime, and an application of from ½ ton to 1 ton per acre will assist in correcting acidity and generally in improving the condition of the soil.

PLANTING DISTANCES.

Eight to 10 feet is usually allowed between rows, and 15 to 16 feet between plants. The numbers of plants required to the acre at the various distances are 8 feet by 15 feet = 363 plants, 8 feet by 16 feet = 343 plants, 10 feet by 15 feet = 290 plants, and 10 feet by 16 feet = 270 plants. In general, the more fertile the land the greater should be the distance between the vines and the row-spacing should be correspondingly reduced.

Nothing is to be gained by crowding the plants, which should be allowed room for a natural vigorous development. Spacing should be sufficient to permit of cultivation with implements where possible without risking damage to the trellises, even when wide spreaders are used on the horizontal type of trellis. Planting too close in the rows has little or no advantage, for after the first year the foliage of the vines will become too dense. It will then be necessary to cut out, possibly, half the number of vines in order to keep the foliage sufficiently open to admit light and allow for the free circulation of air throughout the vine. Also, it is necessary to permit dead leaves to fall clear to the ground, carrying with them perhaps fungus spores which would more readily infect other portions of the plant if allowed to remain caught up in a mass of foliage on the trellis.

TRELLISING.

For the proper development and ripening of the fruit sunshine and air should penetrate to all aerial parts of the vine, hence the advisability, wherever possible, of running the trellises in a north-south direction. The vines will then have an even distribution of sunlight over the whole of the growth on the trellis. On hillside plantations it is not always possible nor desirable to adhere to this rule, since factors such as the conservation of surface soil are all-important. Less erosion is likely to follow where the vines are planted across the slopes and the soil hilled along the rows with cultivation. Any stones, unburnt logs, &c., should also be placed in the rows. Each row will thus eventually provide a surface drain, which will carry off its share of excess water during periods of heavy rain.

Horizontal and Vertical Trellises.

In commercial vineyards, trellises are mainly of two types, the vertical and the horizontal. Both have advantages and disadvantages, but on the whole the horizontal is considered the more suitable. The outlay for wire, posts, and strainers and their erection is a factor which often influences the type of trellis to be erected. A vertical trellis is less costly, and therefore if posts and strainers have to be purchased many growers erect this kind of trellis at first and for later plantings use the horizontal type. Wherever it is possible for a grower to split and erect his own posts and strainers a considerable saving will result. Usually there is plenty of suitable timber growing handy. Most of the natural hardwoods last longer than the passion vines, and may therefore be safely used, but if selection is possible posts should be split from bloodwood, ironbark, grey gum, or yellow stringy. These timbers will last for many years.

Substantial trellises only should be erected, because they must bear a heavy weight of vine and fruit. The top wire in whatever kind of trellis is built should be not less than 6 feet from the ground in order to permit plenty of room for fruit-bearing laterals and to allow them ample light and air.

In a horizontal trellis (Plate 129) the two wires are run side by side, while in a vertical trellis the wires are run one above the other as in an ordinary fence. The posts for the trellis should be 7 feet 6 inches long, 7 inches wide, and about 4 inches thick. They should be set 18 inches in the ground, and 15 or 16 feet apart, dependent on the distance apart it has been decided to plant the vines.

The strainer posts should be of much heavier timber, and may be either round or split. They should be set 2 feet 6 inches in the ground and must be well strutted or stayed so as to take the strain of the wires; the portion in the ground should be free of sapwood. One strainer to every 80 yards of trellis will prove sufficient in most locations. The posts should be erected with their width across the row.

For a vertical trellis (Plate 127) holes are bored in the posts through which the wire is run. One wire is run as close to the top of the post as practicable, and a second, and sometimes a third wire, is run usually at 12 and 18-inch spacings below, 15 inches being the average spacing between these wires.

Plate 127.
VERTICAL OR FENCE TYPE OF TRELLIS WITH THREE WIRES.

As stated previously, the horizontal type of trellis is considered most suitable. The distance between the two wires may be anything from 9 to 24 inches, but wide spacing has the advantage over the closer method in that it permits the entry of sunlight and air between the two sets of laterals, thus promoting the flowering and setting of fruit on the inner growth of the vine. At the same time this practice assists materially in maintaining a more open growth, allowing dead and diseased leaves to fall clear to the ground, carrying with them any fungus spores adhering to their surfaces.

In order to keep the wires apart in a horizontal trellis, a T-piece not less than 2 inches by 2 inches, cut to the length desired, is fastened to the top of the post and the wires run through holes bored in the ends of the T-pieces and strained on the strainer posts.

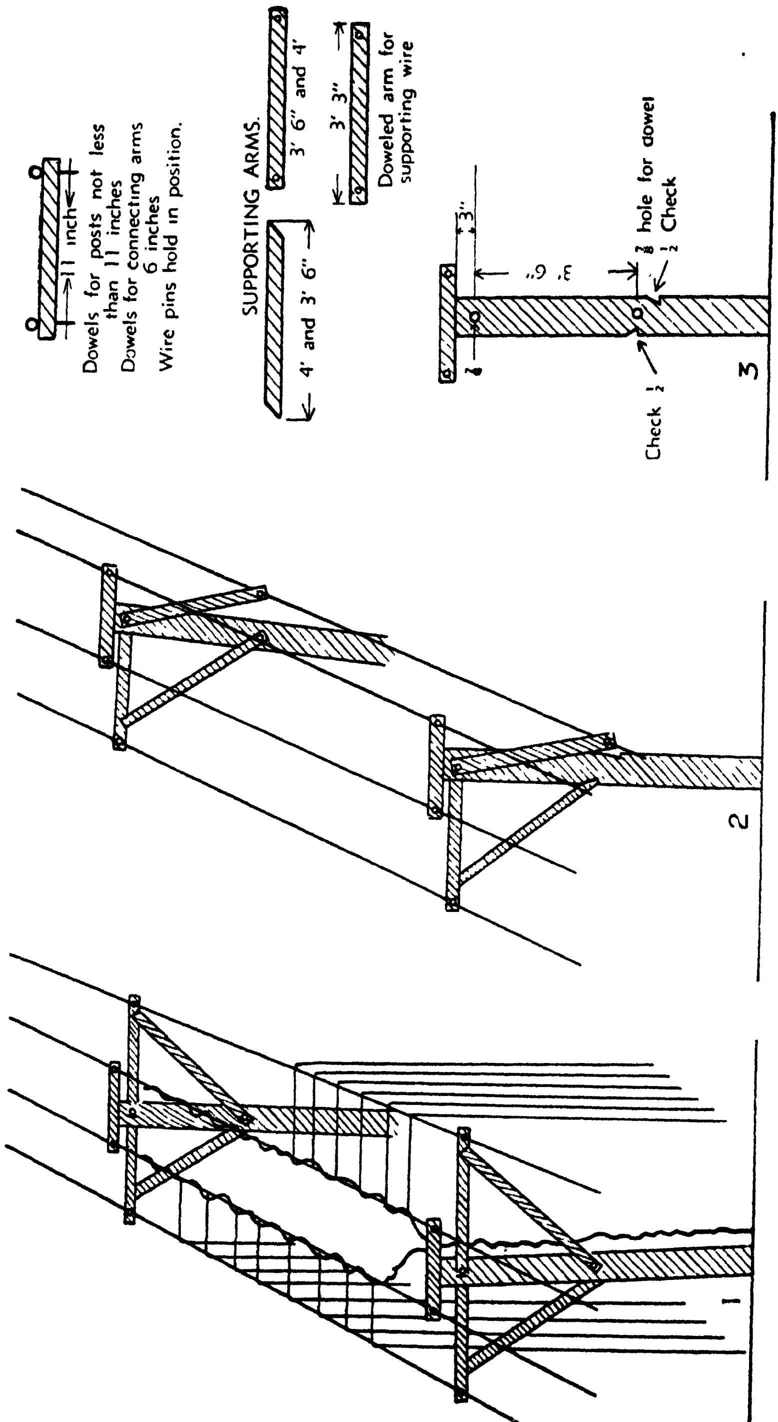


Plate 128.

DIAGRAM SHOWING HOW THE EXTENSION TRELLIS IS ATTACHED TO THE MAIN TRELLIS.

It is an advantage to make some provision whereby the wires can be kept strained, and so prevent heavily-laden laterals from sagging to the ground. Small cast-iron rollers may be procured cheaply and are excellent for this purpose, being easily operated and always in position.

Various gauges of wire are used. Some growers prefer No. 8 galvanised iron wire, while on some of the more recently erected trellises 10 or 12-gauge high-tension steel wire has been used. This wire, though rather thin, is very strong and carries the weight satisfactorily; also, there is less stretching and sagging between the posts than is the case with iron wire. Black iron wire, although cheaper to buy, is not so suitable as it soon rusts, stretches, and sags, necessitating propping up between the posts in order to keep the laterals and fruit clear of the ground.

Should the wires sag between the posts, stakes may be placed temporarily in position to support the wire until the crop has been harvested; then, after pruning, when the weight on the trellis has been reduced, the wires may be restrained with little possibility of the wire snapping.

An Extension Trellis.

The recommended practice is to keep lateral growth of the vines off the ground, and growers are advised to cut back vigorous growths to within 6 inches of the soil surface. When vines lie on the ground the fruit becomes badly scarred and of little value, except as low-grade or factory fruit. Shortening of laterals undoubtedly removes a considerable amount of growth capable of carrying fruit, and the following description of a temporary extension trellis shows how it is possible to increase the length of laterals without hampering cultural, spraying, or harvesting work, and enable a grower to get a higher yield of high-grade fruit from his vines.

Plate 128 illustrates a simple way of attaching an extension set of wires to existing trellises. This extension system makes possible increased lateral growth for an extra 2 feet on each side of the vine, or giving a net gain of 4 feet over the whole lateral growth of the vine. In addition, the extra shade provided by the extension gives greater protection from the direct rays of the sun for the main stem of the vine; this is very noticeable where trellises are 6 feet or more above the ground. Moreover, a greater area of ground is shaded during hot weather, and this helps to keep the surface soil at a moderate temperature, reduces the loss of moisture through evaporation, and makes weed control easier, thus reducing chipping costs and allowing more time for spraying and other jobs. After the fruit has been picked, and, if seasonal conditions are suitable, the bearing laterals should be pruned right back. The extension trellis can then be lowered out of the way beside the trellis posts, thus allowing full use of the space between the rows of vines for the planting of green cover crops. When the new laterals have grown sufficiently to warrant its re-erection, the extension trellis can be raised into position again, the wire automatically picking up the lateral growth as it is strained to the proper tension.

The measurements given in the diagram are suitable for trellises where the rows are planted 8 feet apart. Where the planting distance is wider, the length of components may be increased. The system can be installed on either horizontal twin-wire trellises or on the vertical fence type; in the latter type, however, only the laterals from the

leaders on the top wire should be trained over the extension. If sawn timber is used, approximately 15 feet of 2-inch by 1-inch hardwood battening is needed for an extension at each supporting post in the trellis, viz.:—

2 horizontal arms to support wire, each 3 feet 3 inches;

2 supporting members, each 3 feet 6 inches to 4 feet.

The few inches left over will provide sufficient material to make the dowels, which are cheaper than bolts and nuts. A ⅞-inch hole should be bored about 3 inches below the top of the post to take the wooden dowel on which the extension arms hinge. Of course, holes of similar size are bored in one end of each extension arm, a smaller hole for the wire to pass through being bored at the other end. The arms are set on opposite sides of the post as illustrated. Dowelling is strongly recommended, because the supports are not likely to be knocked out of the check notches during rough weather or when working among the vines.

The extension arms should be at least 3 feet 3 inches, or up to 3 feet 6 inches if desired, and this should allow sufficient room for the grower to reach the centre of the trellis from either side of the vine, in order to prevent the vine growth from matting and harbouring disease-infected leaves; at the same time, sufficient space is left for passing up and down the rows between the sets of trellis.

The supporting arms should be set at such an angle as to ensure the maximum support. Wooden dowels on which the arms are hinged should be sufficiently long to allow a small hole being bored at each end. Through these a nail or wire pin can be pushed, thus holding the arms in position. The same applies to the dowel holding the arms together near the end through which the wire runs.

No. 10 gauge galvanised wire is suitable for the extension. It should be strained when the arms have been dowelled in position, sufficient length being left at the strainer post so that it can be slackened off slightly when the extension is not in use. Small iron rollers suitable for straining the wire can be purchased cheaply. The wire for the extension is run through the straining post used for the main trellis. No extension arms should be attached to the strainer. The strain on the wire should be just sufficient to support the weight of laterals without sagging between posts. When the extension is not required it may be dropped to hang down alongside the post, the dowels holding the arms together near the wire being removed to facilitate this.

It is not necessary to completely dismantle the extension if the wood used is hardwood, but if softwood is used then it should be dismantled and stored until needed again. If the system is dismantled it will be necessary to mark or number each row and each section of the extension; the posts also from which it is removed should have identification marks so that when required again each member can be re-erected in its original position.

PROPAGATION.

Passion fruit plants may be propagated either from seed or from cuttings, though the latter practice is rare. Growers are recommended to raise their own plants, and for this purpose only fully matured fruits selected from healthy vigorous vines should be used. Great care should be given to the selection of the fruits for seed purposes,

as the passion vine is subject to several diseases and the possibility of transmitting these diseases by seed cannot be ignored. The seed may be allowed to remain in the fruit, which will naturally dry up, until it is required for planting. Another method is to remove the pulp and place it in a vessel of water for a few days until it ferments, when the seeds will easily separate from the fruit pulp. The seeds should then be washed in clean water and placed in the shade to dry.

Should early spring-ripened fruits be selected and the seeds planted immediately, seedlings will be ready to plant out in summer. A later sowing would provide seedlings suitable for autumn transplanting.

If spring planting is desired—this being the season most preferred—then seedlings should be raised from fruits maturing in the previous late summer. Such seedlings should be well grown before winter and be available when seasonal conditions are suitable for transplanting with every prospect of the young vines rapidly establishing themselves in their new situation. The site of the seed-bed should be very carefully selected. It should not be in close proximity to any other passion vines, either cultivated or otherwise, owing to the possibility of introducing woodiness or other diseases into the nursery. The soil should be friable and contain an abundance of plant food. After the soil has been well worked into a fine state of tilth, the seeds should be planted about half-an-inch deep in shallow drills made about 9 inches apart, the soil afterwards being firmly pressed and covered with half-an-inch of fine horse manure as a mulch. The seedlings should appear in from four to six weeks, and as they develop they may be thinned out to about 4 inches apart; those remaining will then develop into sturdy plants with good root development. Lanky, weak plants will result from any crowding in the seed-bed.

Some growers first erect the trellis and then plant several seeds at the required planting distance under the trellis, afterwards selecting the most vigorous of their young plants and removing the others. This practice is not recommended. Germination is often poor, the young plants are exposed to infection from any diseased vines which may be in the vineyard, and, generally, they require extra attention until they become well established.

Transplanting actually may be done at any time during the year, but from September to February is recommended, with a preference for the spring months. March to August planting is generally not advisable, except in very warm situations, as the plants often do not establish themselves satisfactorily and remain stunted.

When plants have reached a height of about 9 inches, they may be safely transplanted. If they have been allowed to grow much more than this, about a fortnight before transplanting the excessive top growth should be cut back and the larger roots severed by pushing a spade down full depth between the rows.

TRANSPLANTING.

Dull, cool or moist weather is better for transplanting than hot, sunny or windy days. Under the latter conditions evaporation of moisture from the young plants is likely to be excessive. It is advisable to dig large-sized holes for the reception of the plants. Approximately 12 inches in diameter and 12 inches deep is best. The position of each

hole should be midway between the trellis posts. When planting, spread the roots evenly in a downward direction at about 45 degrees, and fill in fine top soil, which should then be well firmed. When the hole is completely filled with soil, the plants should be growing at approximately the same depth as they were in the nursery, but not deeper. If planted too deeply the crown of the plant is likely to be attacked by a fungus rot, which will destroy it.

Only as many plants as can be planted within an hour or two should be dug from the bed at one time, and after removal from the nursery they should be kept continuously covered with a wet sack until planted. It is a good plan to give the bed a thorough soaking with water the day before digging the plants. The roots of the seedlings will leave the bed more easily, and will not be excessively damaged. They will also absorb moisture, which will assist them to recover from the shock of transplanting.

TRAINING THE VINE.

From the beginning the grower should have a definite system in mind and train the vine systematically, so that a good solid framework is modelled on the trellis.

Within a few weeks after transplanting the young seedlings will have become established and vigorous growth will develop. Numerous shoots will appear from the crown of the plant and in most cases they rapidly overtake the original growth of the vine. When they have attained a growth of from 12 to 18 inches, one, two, or four (according to the grower's wishes) of the most vigorous growths should be selected to form the main stems of the vine. All other growth should then be carefully cut away. A light stake or pole should be driven into the ground alongside each seedling and fastened firmly at the top to the wires on the trellis. The stake acts as support for the vines until they have become firmly established on the wires. With the growth of the stems it is necessary to keep them tied at intervals of 9 to 12 inches to the stakes in order to prevent them from being broken or damaged through being blown about by wind.

The common practice with growers is to tie the vines after giving them a twist round the stakes. This is not the best method, because it necessitates at a later stage searching for the ties and removing them; if they are permitted to remain, they may cincture the vines as they grow. The best way is to tie a leaf stalk and tendril to the stakes, leaving the main stems clear of the ties. This is equally efficient as tying the stems, and avoids the necessity for later removal of the ties. Some extra time may be spent in the first place, but it will be more than made up later on. Pieces of strong sacking cut into squares about 6 inches by 6 inches will unravel easily, and the strands make quite good ties.

All side branches arising from the stems between the ground and the wires should be carefully suppressed. Leaves only on the stems between the ground and the wires should be allowed to remain; these shade the stem and aid the development of the young plants.

Each grower must decide for himself whether he prefers one, two or four stems, but two stems are considered most satisfactory. The vines cover the trellis with comparative rapidity, and if planted in the spring produce a good crop in 12-15 months. In addition, there is the

advantage that, if one stem is damaged through any cause, the vine is not completely lost, the second stem remaining to carry on until a new leader is produced. It is important that the stems be as nearly as possible the same size, otherwise the more vigorous stem will rob the smaller and outgrow it. Vines trained on a single main stem take longer to establish a complete cover on the trellis, but during early life are much easier to keep in control, as the growth is not nearly as dense as that developed by the multiple stem system. On sloping land, where trellises may for some reason have been erected up and down the slope, two leaders are best, and as vines always grow more vigorously up hill than down, they should be trained on the wires to grow in the direction of the top of the plantation.

Training on the Vertical Trellis.

In the case of the vertical trellis, if only one stem is left it should be allowed to grow until it reaches the bottom wire, when the top inch or so should be pinched out. The stem will then throw out side branches near the top. Three, or perhaps four, of these should be selected, growing as near to one another as possible. Two should be trained in opposite directions along the bottom wire, and the other one or two carried on to the top wire where, if only one is carried on, the tip should be again pinched out and two wide branches allowed to grow for training in opposite directions along the top wire. If two branches are carried on from the bottom wire, they are merely trained in opposite directions along the top wire.

When two main stems are allowed to grow from the ground, the tip of one should be pinched out on reaching the bottom wire and two branches allowed to develop for training along the bottom wire, whilst the second stem is permitted to grow until it reaches the top wire where it is similarly treated.

In the case of four main stems, two are trained in opposite directions along each of the wires.

Training on the Horizontal Trellis.

With the horizontal trellis, if only one stem is left the tip should be pinched out when the wires are reached, and four branches growing as close together as possible should be allowed to develop for training in opposite directions along the two wires.

If two stems are left, the tips are pinched out and two branches allowed to grow from each, whilst with four stems they are merely trained in opposite directions along the wires as they reach them.

The sections of the vines which grow along the wires are termed "leaders." They should not be permitted to ramble along the wires at will supported only by the tendrils, but should be given long, gradual turns round the wires and loosely tied at intervals, care being taken to maintain the turning in the same direction to prevent sagging loops. Sharp turning round the wires should also be avoided, as this may tend to check the sap flow. As the leaders proceed along the wires lateral growth will develop, and this will be accelerated if leader terminals are nipped out on reaching the approaching growth of the neighbouring vine.

The laterals should be encouraged to grow straight down rather than be allowed to grow in any direction. By controlling the laterals in this way the vines are kept more open, and the work of spraying, harvesting and pruning is made very much easier.

Plate 129.
A HORIZONTAL TRELLIS WITH THREE WIRES.

Plate 130.
A HORIZONTAL TRELLIS WITH FOUR WIRES.

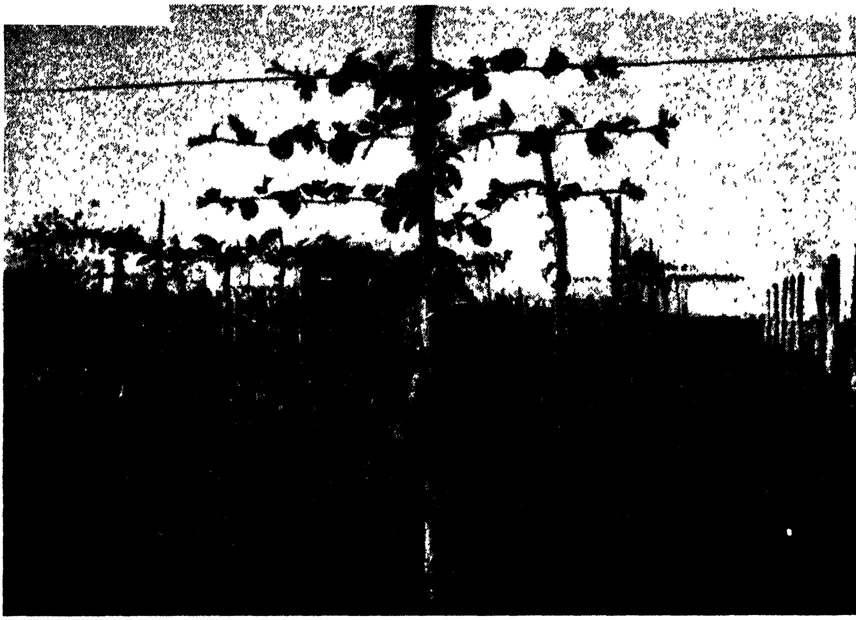


Plate 131.
A SIX-WIRE VERTICAL TYPE TRELLIS.

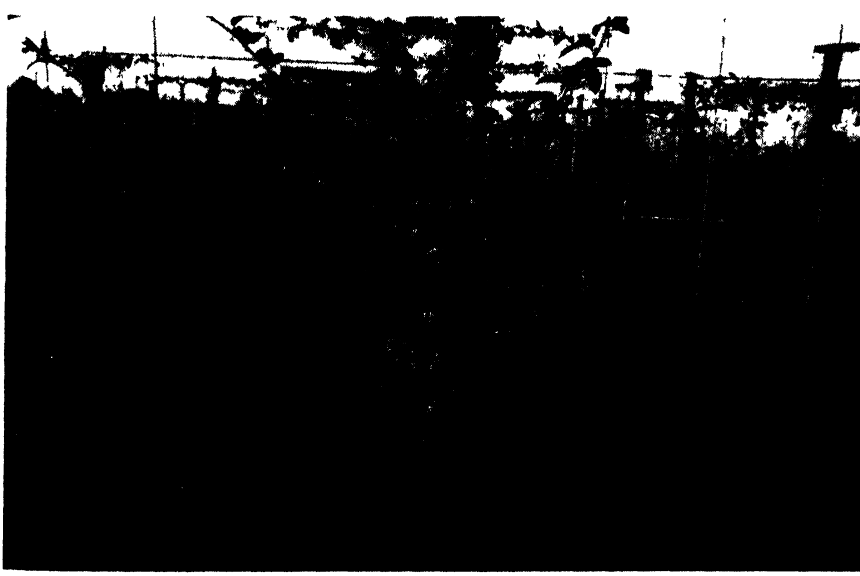


Plate 132.
A TRELLIS MADE WITH WELDED SHEEP FENCING WIRE.—The leaders are spread fanwise.

Training on Other Forms of Trellis.

Apart from the vertical and horizontal trellises described, there are a number of modifications which some growers adopt with varying results. In the main they are more expensive to erect, and it is doubtful whether recompense is obtained for the additional outlay.

Plate 129 illustrates a horizontal trellis with three wires. Two leaders are grown along the middle wire and the side laterals are trained over the outside wires.

Plate 130 shows another form of horizontal trellis with four wires in which four leaders are grown along the inside wires and the side laterals trained over those outside. This system permits of wider cross pieces being used on the trellises, but often results in a mat or shelf of vines on the top of the trellis, which holds dead and diseased leaves instead of permitting them to fall to the ground.

Plate 131 shows a six-wire vertical type of trellis on which twelve leaders are allowed to grow. The use of a trellis such as this results in the side laterals from the top leaders tending to exclude light and air, and consequently smothering those on the bottom wires.

Plate 132 illustrates a trellis made with welded sheep fencing. This type is used in Victoria, where the growth of vines is very slow in comparison with their vigorous development in Queensland. The stems or leaders are spread fanwise over the wires. Good crops are borne and the vines are well spread, but considerably more time is occupied with pruning than when the two-wire horizontal or vertical trellis is used.

CULTIVATION.

Caution is needed in regard to the use of cultivation implements, especially when the vines are in vigorous growth. Passion vines are comparatively shallow rooted, and not a few growers have suffered considerable loss when, with the best intentions in the world, they have ploughed or cultivated deeply at a time when a good crop was hanging, and afterwards found that their fruit just withered and fell and the vines assumed a sickly yellow appearance. Such a condition will follow the cutting and breaking of feeding roots at a time when the vines most need their support. Cultivation, then, during the main growing and fruiting periods should be shallow and confined merely to the control of weeds and the breaking-up of the top inch or so of surface soil to prevent caking.

It is more or less essential to break up the soil deeply once a year, and this is best done during the winter about July after the vines have been pruned. Where horse or tractor drawn implements are used, the land up to within 18 to 24 inches of the vines may be ploughed to a depth of about 6 inches, whilst on steep and rough locations, or where the land has not been stumped, cultivation as deeply as possible up to the same depth is best achieved by the use of mattocks or pronged hoes.

Care is also essential when attempting light cultivation or weed control around the immediate base of the vines in order to ensure that the crown and main roots are not injured by implements. Soil-frequenting fungal organisms often quickly enter at such points of injury and set up a condition known as base rot. It is preferable to hand pull all weeds in the vicinity of the stems. Furthermore, during cultivation the crown of the vines should not be covered with soil or with destroyed weed growth, but left exposed to the sun and air. Little trouble will then be encountered with base rot.

Vines should be kept well cultivated along the lines set out from the time they are planted. They will then develop rapidly and produce good crops. Vines insufficiently cared for when young lack vigour, and their development is retarded. Even if they do produce a large quantity of fruit, it is usually small and of poor quality. Older vines will also suffer during hot dry spells if cultivation is neglected, as the soil cannot hold sufficient moisture at such times to support both vines and weeds.

GREEN MANURING.

The growing of green-manure crops planted between the trellises during the months of October and November to provide a cover crop prior to the commencement of the wet season is a matter which should be given attention. Crops such as Poona pea and other cowpeas, tick beans, field peas, mustard, lupins, and others are suitable. If grown through the wet season and into the winter they will not seriously interfere

Plate 133.

RECONDITIONING PASSION VINE SOILS.—Green-manure crop of mustard ready for turning under.

with the growth of the vines, will assist in controlling erosion, and when turned under will materially assist in improving the fertility of the soil. On soils of good to medium fertility a dressing of about 200 lb. to the acre of fertilizer containing nitrogen applied at the time of sowing the seed will be of considerable assistance in the production of a good cover.

On poorer soils or in plantations which have been badly washed, or where hot fires have occurred, the condition of the soil can be improved by turning under green cover crops. On badly washed areas where difficulty may be experienced in getting legumes, such as Poona pea and other cowpeas, to grow, mustard will generally provide a good first crop; subsequently peas may be planted successfully. Cover crops on poor soils will be materially assisted by a preliminary dressing of 1 cwt. of sulphate of ammonia and 2 cwt. of superphosphate per acre.

It has been observed that a crop of skinless barley planted between rows of young vines and ploughed under in February has proved beneficial. It should be noted, however, that after the vines have covered the trellises, ploughing in February should be limited to the middle of the rows, as the root system of the vines will have extended well out by that time. Green crops planted subsequent to the first year's growth of the vines should be confined to a narrow strip along the middle of the rows.

IRRIGATION.

Earlier it was mentioned that, if a dry spring extends into a hot, dry summer, some defoliation and loss of fruit must result. The provision of irrigation water where available will prove a complete safeguard against such a setback, and will prove profitable in other ways in that the vines can be kept growing and blossoming practically throughout the year. It will be noted under the heading of pruning that the time for doing this work is governed to some extent by prevailing weather conditions. Aided by irrigation, this handicap disappears. The vines can be well watered prior to pruning, and again after the operation, without danger of suffering any check, and furthermore can be forced into growth at once for the production of an early crop. Furrow irrigation is to be preferred where the land is nearly level, but on sloping land overhead spraying is quite successful.

During dry periods hand watering will prove worthwhile where irrigation is not possible. It is remarkable how even a small quantity of water poured round the base of each vine every second day will enable the plants to retain not only foliage but fruit. The watering is best done late in the afternoon to avoid loss by evaporation.

FERTILIZING.

The passion vine, being a vigorous grower, demands a plentiful supply of available plant food. The soil, therefore, should be at least reasonably fertile. Where planted on good virgin land there should be ample nutritive elements available for the first year or two. Subsequently, and also from the outset on poorer areas, artificial fertilizers will prove of considerable benefit.

A recommendation as to the best formula to use for all plantations cannot be made dogmatically, for better results have been obtained by the application of certain mixtures on some areas whereas other mixtures have been equally successful in other plantations. Each grower, whilst applying a general mixture to his vines, should carry on small scale experiments with others and note any difference. The amount of fertilizer required will depend to some extent on the fertility of the land, poorer areas requiring more than those of better quality, but from 4 cwt. to 8 cwt. per acre will prove a reasonable application.

The various fertilizer dealers stock general orchard mixtures which have given good results in many instances, whilst other growers experimenting with a special 10–6–10 mixture of sulphate of ammonia, superphosphate, and sulphate of potash have produced excellent crops. Applications of farmyard and poultry manure should be used whenever these materials are available (Plate 134). Whatever fertilizers are applied are best divided into two dressings, one during the winter cultivation about July and a second about January, in order to be in time for the autumn flowering for the winter crop.

Plate 134.
FOWL MANURE BEING WORKED INTO THE SOIL.—Note distance from base of plants.

PRUNING.

Some growers claim that pruning definitely gives them bigger and better crops, others say they get just as big crops from unpruned vines but admit that the size of the fruit and its quality are not as good as from pruned vines. In any case, whatever influence pruning has on the size of crops, the wise grower will prune for the following reasons:—

To keep the vine in good health;

To remove diseased, dead, and unprofitable growth;

To keep the growth in check on the wires in order to admit light and air and prevent congestion;

To induce the production of healthy, vigorous wood on which high-grade fruit is set;

To replace spent, bare leaders by the development of new ones;

To keep the lateral growth clear of the ground and properly spaced;

To regulate the time of bearing so that the highest market prices are obtained for the fruit;

To assist disease control and increase the life of the vine;

To cheapen the cost of spraying.

When left unpruned, vines soon become a tangled mass of wood and foliage in which fungus diseases may develop and rapidly shorten the life of the vine. It is essential, therefore, to maintain an open habit of growth in order to admit plenty of light and air to all parts. All dead and diseased wood should be cut away and burnt in order to reduce the risk of infection. The best fruit is produced on healthy, vigorous laterals, and the object naturally is to produce the greatest amount of such growth possible. It will be found that, by checking the

growth of laterals when they are about 6 inches from the ground, strong secondary laterals on which fruit will be borne will be produced all along the sides of the laterals, and the bearing area of the vine will be thus increased considerably. In addition, the vine will be kept free of the blemished fruit which would be produced if the laterals were permitted to grow on the ground. The shortening of laterals to keep them clear of the ground may be done at any time without harming the vine.

Passion vines should be given a heavy pruning once each year. There are modifications in some instances which are discussed later on. Usually, July or August is the best time, when most of the winter crop has been harvested, and before spring growth commences. The most suitable time for commencement of pruning will vary in different districts, and possibly even in different parts of the same district, due to

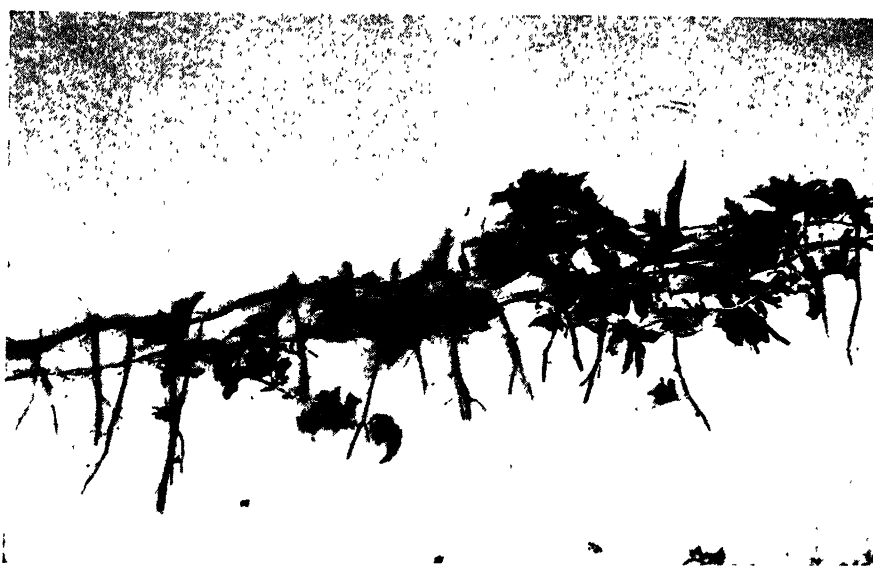


Plate 135.
VINE AFTER PRUNING.—The laterals are cut back to 9 to 12 inches from the leaders on the wires. It is at this stage that deep cultivation is best practised.

environmental factors bearing on growth and crops, as described earlier. A most important feature also to be borne in mind is that *vines should not be severely pruned during a very dry spell.* The soil should be in good condition so far as moisture is concerned. Severe pruning when the ground is dry has caused the death of many vines. Pruning at about the time mentioned is preferable from the aspect of control of a serious fungus disease known as brown spot, information concerning which is obtainable upon application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

There are no hard and fast rules for pruning. Each vine may present a different problem, and consequently only general recommendations as to the procedure will be discussed. It should perhaps be mentioned that pruning is apt to prove a slow and tedious job, and much patience is required to do the work properly. However, the grower

will be well repaid for the time and care expended. Firstly, with the aid of a reaping hook, all laterals should be severed at about 12 inches below the trellis wires. When this has been done, the great bulk of the vine has been removed, and it is possible to obtain a much clearer view of the more intimate pruning required. From the leaders on the wires all dead, diseased, and spindly wood should now be cut away, using a pair of secateurs, and the stumps of the stronger laterals which it is intended to leave should be allowed to remain about 9 to 12 inches long. Each shortened lateral will then have two or three buds from which the new growth will start for the next crop. It is not advisable to cut back more severely than this, as the bearing capacity of the vine may be affected.

Some growers prefer to give two light prunings each year—one during the winter and a second about January-February, after the main summer crop has been harvested and before flowering for the winter crop commences. Others, in addition to heavy winter pruning, like to give a light pruning following the summer crop. Both modifications give good results, the latter in particular. When conditions are too dry for severe pruning during the winter, the system of two light prunings can be safely adopted.

Light pruning (by which is meant in general the cutting away of up to half the length of the laterals) at any time of the year, provided there is sufficient soil moisture, will cause the vine to put forth new growth and blossom, the development of which regulates the period of production of a crop.

Under ordinary circumstances heavy pruning in the winter will produce a big summer crop and a somewhat smaller winter crop. By shortening back the flowering laterals about October and sacrificing portion of the summer crop, a bigger intermediate crop will be secured, provided, of course, that the weather is not dry. Similarly, by pruning back the flowering laterals for the ordinary winter crop about February, a late winter crop can be secured.

In warm localities the vine puts out vigorous growth much earlier than in exposed and colder areas. The grower is advised to carefully note his own local conditions and prune to suit that particular location.

REPLANTING.

The commercially useful life of a passion vine under optimum conditions is about four years; however, in the majority of cases, two or three years is the maximum life that may be expected owing to the incidence of "woodiness" and other diseases. Some provision should be made for continuity of production by rotation or by replanting.

Under normal vineyard conditions the heaviest crops will be produced when the vines are between 15 and 24 months old. Subsequent crops will be governed by such factors as the cultural, fertilizing, and spray programme adopted and the incidence of woodiness. In any case, a gradual decline in production and quality of fruit must be expected in older vines. In order, therefore, to keep up a supply of good quality fruit, new vines should be coming into bearing every year.

The practice of planting young seedlings midway between older vines in the rows is not recommended because of the rapidity with which they become infected with disease.

Where land is to be replanted all vine growth must be removed from the trellises and either allowed to dry out for burning or fed to stock before replanting.

By rotation, areas can be kept isolated from each other either by distance or natural vegetation. Young seedlings planted out do much better under this system. They are not so much exposed to infection from diseased neighbouring plants, are more vigorous in growth, and produce earlier and heavier yields.

Under rotation extra trellises and more extensive cultivation are necessary. This additional expense is offset, however, by the advantages already mentioned. Under this system, too, the land can be periodically spelled from passion vine growing, and the trellises more easily repaired or replaced as required.

Whatever method is decided on, it must be borne in mind that to obtain the maximum profits from passion fruit growing provision must be made for the setting out of new vines at regular periods to replace the older ones, as their production falls in quality and quantity. Experience suggests that a two-year system of replanting or rotation is satisfactory where disease is kept under control. However, should "woodiness" or other diseases be troublesome, annual planting out of young vines is recommended.

HARVESTING AND PACKING.

Harvesting, packing, and marketing are quite as important as production, and every grower should aim at presenting to buyers well-matured, properly graded, attractively packed fruit. Enhanced prices received for well-got-up fruit will justify the time and labour expended on its preparation for market.

Fruit should be gathered daily—preferably in the early morning or late evening, when the fruit is cool; it is then not so likely to arrive on the market in a wrinkled or shrivelled condition. All dropped fruit should be picked up first, as a couple of hours in the hot sun is sufficient to cause severe scalding and possibly render the fruit unsuitable for packing.

The degree of maturity at which the fruit is picked from the vine is of vital importance, and judgment is required in order to obtain the right colour without the fruit being so far forward that it is likely to wrinkle. Good colour is very desirable, and during the cooler weather the fruit should be picked when it has assumed a deep purple. However, during hot weather fruit should be gathered when just a light purple shade has extended over half to three-quarters of the surface of the fruit.

When harvesting during wet weather, allow the fruit to dry off thoroughly before picking. All fruit should be carefully picked to prevent the skin being damaged. This is best achieved by grasping the fruit in the hand with the thumb and forefinger on the fruit stalk, then with a forward pressure of the thumb and a backward pressure of the forefinger the fruit will be easily detached at a point where the fruit stalk joins the tendril just above the dead flower.

The picked fruit should be placed—not dropped—into the picking boxes or tins, which should be placed on the ground or slung on the body. These, when filled and until despatched, should be kept as cool as possible and sheltered from strong winds.

Bordeaux spray can be removed by immersing the fruit in a weak solution of hydrochloric acid for one and a-half to two minutes, afterwards washing off with fresh water and allowing to drain before packing.

Passion fruit forwarded to the fresh-fruit market should be packed in half-bushel dump cases. Full instructions for packing the different grades are contained in an illustrated booklet, which may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Fruit intended for factory use need not be packed in cases but may be forwarded to the canneries in sugar bags or similar containers.

YIELD.

Some controversy exists as to the amount of fruit produced by a passion vine. Naturally, factors such as soil, shelter, location, aspect, irrigation, cultivation, and disease control have a marked influence on production. However, the following production figures of vines which have been grown without irrigation may be taken to represent a good average yield. The seedlings were planted in November, 1945, at Springbrook.

Number of vines	700.
Distance	16 feet between vines.
	9 feet between rows.

	Cases.	
November, 1946	19	
December, 1946	60	
January, 1947	169	
February, 1947	67	
March, 1947	68	
April, 1947	43	
May, 1947	20	
June, 1947	49	
July, 1947	135	
August, 1947	182	
September, 1947	18	Vines pruned.
October, 1947	12	
November, 1947	Nil	
December, 1947	Nil	

This gives an average yield of a little more than one half-bushel case per vine per 12 months.

PESTS AND DISEASES.

The passion vine is attacked by some insect pests. Spotting of the fruit results from the feeding activities of some minor sucking insects, but little damage is done beyond a slight blemish of the outer skin. As the pulp is not affected, the fruit is not harmed. Fruit flies attack the fruit in its green stage. The eggs usually do not hatch, but the skin surrounding the puncture becomes hard and detracts somewhat from the appearance of the matured fruit. Red mite may infest the axillary buds of the main stem and sometimes the leaves and fruits. Sulphur sprays may be needed to control it.

Fungus disease such as brown spot and a virus disease known as woodiness or bullet, to which the passion vine is very susceptible, are the main causes for the premature failure in many vineyards. Powdery scab is a minor fungus disease which attacks the terminal growths and fruit during the cooler months of the year. Its attack is more serious on vines up to 18 months old, since the proportion of the plant affected is then relatively greater.

Brown spot is the most troublesome disease affecting the vine. It attacks leaves, stem, runners, and fruit, causing considerable damage, and if neglected will result in the death of the vine within two years. Young vines are not so seriously attacked as older ones, as the more open growth admits light and air and permits most of the affected leaves to fall to the ground, carrying the fungal spores with them.

Woodiness is a serious virus disease, and growers are advised to exercise every care in an effort to prevent its spread.

Literature dealing with the control of passion vine pests and diseases may be obtained on application to the Department of Agriculture and Stock, Brisbane.

METHODS OF MAKING WHITEWASH.

1. Take a half bushel of unslaked lime and slake it with boiling water, covering during the process to keep in steam. Strain the liquid through a fine sieve or strainer, and add to it a peck of salt previously dissolved in warm water, 3 lb. of ground rice boiled to a thin paste and stirred in while hot, one-half pound of Spanish whiting and 1 pound of clean glue previously dissolved by soaking in cold water, and then hang over a slow fire in a small pot hung in a larger one filled with water. Add 5 gallons of hot water to the mixture, stir well; let it stand a few days covered from dirt. It should be applied hot, for which purpose it can be kept in a kettle or a portable furnace. Colouring matter may be added as desired. When a less durable whitewash will answer, this method may be modified by leaving out the whiting and glue and omitting the boiling. It need not be applied hot and may be applied with a spray pump.

2. Slake 25 lb. fresh lime in sufficient water to make a paste, sprinkle in 15 lb. of flowers of sulphur, add 30 gallons of water, and boil for an hour. Then add enough water to make 50 gallons and apply with a spray pump, using a Bordeaux nozzle. This is in some favour as a disinfectant.

3. Take 20 lb. of unslaked lime, 3 lb. of common salt, and 1 lb. of alum. Slake the lime with boiling water until of the consistency of thin cream. To increase the antiseptic properties of the wash, add one-half pint of crude carbolic acid to each bucketful.

4. To half a bucketful of unslaked lime add two handfuls of common salt, and soft soap at the rate of 1 lb. to 15 gallons of the wash. Slake slowly, stirring all the time. This quantity makes two bucketfuls of very adhesive wash, which is not affected by rain.

5. Slake lime with water, and add sufficient skimmilk to bring it to the consistency of thin cream. To each gallon add 1 oz. of salt and 2 oz. of brown sugar dissolved in water. The germicidal value of Nos. 4 and 5 may be increased by adding one-fourth pound of chloride of lime to every 30 gallons of wash.

6. Slake quick lime with enough water to make a thick paste. While it is slaking add a pint of melted lard or other grease and a cupful of salt to a bushel of lime. Add enough water to bring the solution to the consistency of thin cream and strain through a piece of burlap. For chicken house or barn where milk is not made it is advisable to add four ounces of some coal tar disinfectant to every gallon of the mixture.

ANT PROTECTIO

Control of the Banana Aphid.

W. A. SMITH, Assistant Entomologist.

THE banana aphid* is present throughout Queensland banana plantations and has been known for many years as the insect vector or carrier of bunchy top disease wherever that disease occurs. Where the disease is absent the aphid has little effect on the vigour of the plant even though populations are often much higher than would be tolerated by less succulent plants. The aphid has no wild host plant of importance in southern Queensland.

Habits in Relation to Control Measures.

Aphids are found mainly on the lower part of the pseudostem, often well underneath the leaf stalks where some lifting of the margin has allowed entry, and even slightly below the soil surface level. On young suckers the younger leaves carry heavy populations. The funnel leaf of the bunch plant and older suckers is usually infested, though sometimes by only a single winged form. Top hands of young bunches may also conceal a few colonies. The winged forms, which are probably mainly responsible for the rapid spread of bunchy top, have been found in many of the colonies in all these situations.

A Recent Insecticide Experiment.

With the range of insecticides available until recently, it has been considered impracticable to effectively control aphid populations throughout the whole plantation, and treatment has been confined to bunchy top affected stools and those in the immediate vicinity. However, with the advent of new insecticides it was thought desirable to ascertain whether more effective control might not be possible. Consequently, a small experiment was recently carried out using three of these types—namely 4 per cent. benzene hexachloride dust; 1 per cent. DDT plus 1 per cent. benzene hexachloride mixed dust; 0·1 per cent. hexaethyl tetraphosphate spray plus a spreader. A 3 per cent. nicotine dust was also included as a standard of comparison. A single liberal dusting (or spraying) of pseudostems, funnel leaves, suckers and bunches was made. Aphid populations were estimated just before and two days after treatment by counting the number of colonies and estimating their size.

It was found that the survival rate of aphids was fairly high. On the pseudostems the kill was 50 per cent. or perhaps more, the actual figure being very difficult to obtain with accuracy. On suckers and funnel leaves where the colonies are more exposed the kill was much greater.

* *Pentalonia nigronervosa* Coq.

The benzene hexachloride and the DDT-benzene hexachloride dusts both appeared slightly superior to the nicotine dust and the hexaethyl tetraphosphate spray in reducing populations on the pseudostem. The residual effect of the first two of these insecticides may be of additional importance in controlling both the aphids and the ants that carry them about. Observation on ant behaviour two days after treatment, however, showed no noticeable differences as a result of the treatments.

The incomplete kill was due to failure of the dusts and spray to penetrate under leaf stalks, and into tightly rolled funnel leaves. In this respect, it is considered that a plantation practice that makes the stems more accessible to dusting would result in a somewhat higher percentage kill. Such a practice would include a "one bunch-one follower" cultural system and frequent trashing of the stems. Dusting of tall varieties would require a deflecting attachment on the dust outlet of the gun to permit dusting of the funnel leaves.

The main factors affecting the rebuilding of aphid populations after an insecticide is applied are the rate of reproduction of the insect, the establishment of new colonies from individuals distributed by ants and the dispersal of winged forms. In summer, when reproduction is very rapid, populations could be kept at a low level only by treatment probably at fortnightly or three-weekly intervals. In the recent experiment, dusts were used at approximately 20 lb. per acre on a "one bunch-one follower" plantation. The time required for thorough treatment was about 2½ hours per acre, though this period could doubtless be reduced if the stems were clean and easily accessible. The economic practicability of using a benzene hexachloride or DDT-benzene hexachloride dust at this rate on a fortnightly schedule when aphid populations are high would have to be considered in relation to the amount of bunchy top loss prevented. In most instances, it would probably be an uneconomic method of attacking the disease.

Present Recommendations for Aphid Control.

The experiments just described were not sufficiently promising to justify altering the present recommendations for banana aphid control. When a plant shows symptoms of bunchy top and the stool must be destroyed a liberal application of kerosene into and around the funnel leaf in sufficient quantity to ensure that it penetrates all the sheathing leaf bases of the pseudostem will quickly make the plant unattractive to aphids and kill those present. It must be realised that in order to be effective the whole of the pseudostem must receive its quota of kerosene. Otherwise some of the sheltering aphids will survive and when the stool is dug out will travel to other plants and probably transmit the virus to them. At least half a pint of kerosene must be used on each plant and in some cases more may be necessary.

An additional method of preventing aphid survival practised by some growers involves the burning of the plant after treatment with kerosene and before digging out the stool. This method can be dangerous and the grower must first be satisfied that no damage will occur to neighbouring stools and that the fire will not be spread by dry weeds or trash through the plantation and perhaps beyond it.

Fertility and Infertility of Sheep.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

[*Continued from page 286, May, 1948.*]

FLOCK MANAGEMENT.

The Queensland Pastoral Environment.

It is well known that the seasonal conditions in any one year influence the lamb marking percentages recorded on a property. It is no less true that the factors which influence the pastoral environment are important in determining the success which might be obtained in sheep breeding year in and year out in any one district.

Distribution throughout the year is probably more important than the total or average rain recorded in a district. This is particularly the case in sheep breeding, because it is important that there should be adequate feed for the ewes during the latter stages of pregnancy and for the lambs at the time of their birth. This means that a regular and well distributed rainfall is highly desirable for successful lambings.

Three of the most important factors influencing the response of the pasture grasses to falls of rain are—

(i.) The amount of rain which falls;

(ii.) The rate at which the moisture evaporates from the soil;

(iii.) The atmospheric temperatures.

A close study has been made of these factors by officers of the Department of Agriculture. The State has been divided into zones depending upon the distribution, on a bi-monthly basis, of rain heavy enough to produce growth of grass. This has been determined by calculating the ratio of the rainfall to the evaporation from the soil. When this ratio exceeds a certain value the rainfall is considered to be "effective." In addition, consideration has been given to the reliability of the effective rainfall. Plate 136 shows the different zones which enjoy 66 per cent. or greater reliability of "effective" rains for periods of different numbers of months.

It is seen from this map that the far western part of the State does not enjoy reliable rains. The main Mitchell grass areas of the north-west and central-west have only two months of effective rain in the summer (which was considered to commence in October and end in March) at a 66 per cent. level of reliability. East of the Mitchell grass downs the summer rains extend over four months.

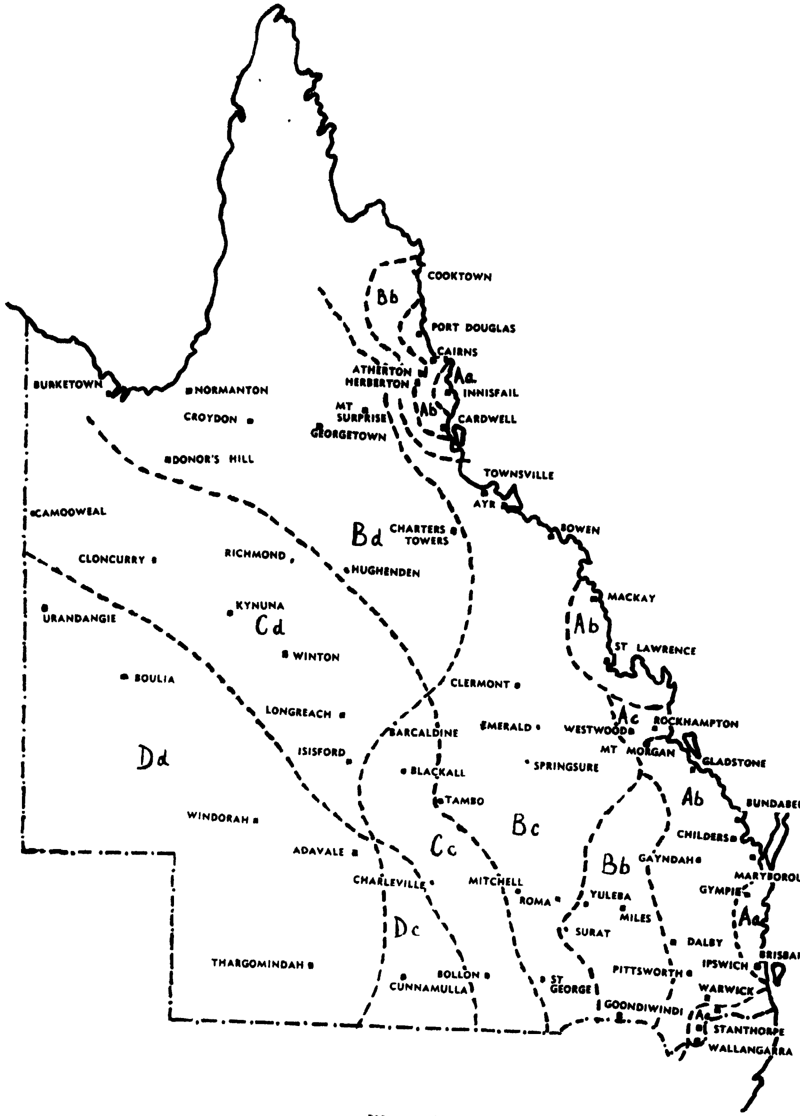


Plate 136.

SHOWING THE DIFFERENT ZONES WHICH ENJOY 66 PER CENT. OR GREATER RELIABILITY OF EFFECTIVE RAINS FOR PERIODS OF DIFFERENT NUMBERS OF MONTHS.

Key to Plate 136.

Summer—				
Number of wet months	6	4	2	0
Symbol	A	B	C	D
Winter—				
Number of wet months	6	4	2	0
Symbol	a	b	c	d

For example, Area Bc has effective rainfall for four summer months or two winter months with a 66 per cent. reliability.

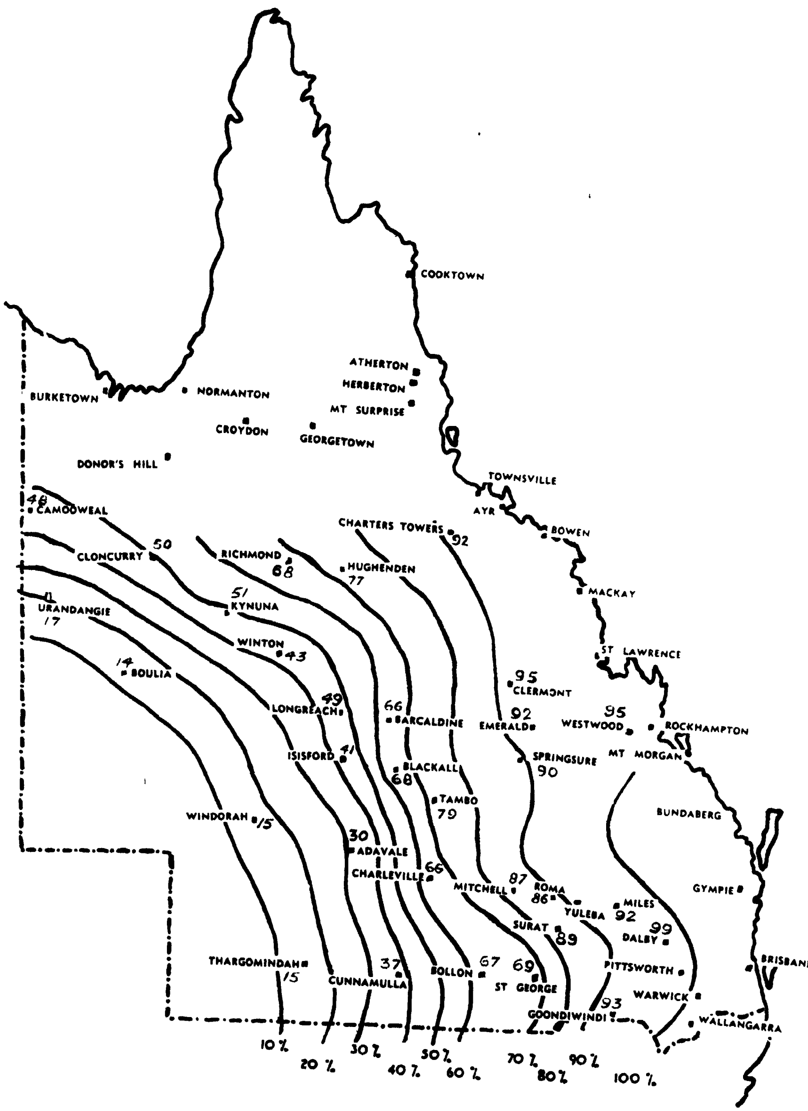


Plate 137.

SHOWING THE PERCENTAGE OCCURRENCE OF GOOD TO FAIR YEARS IN THE PASTORAL AREAS. (For key, see p. 358.)

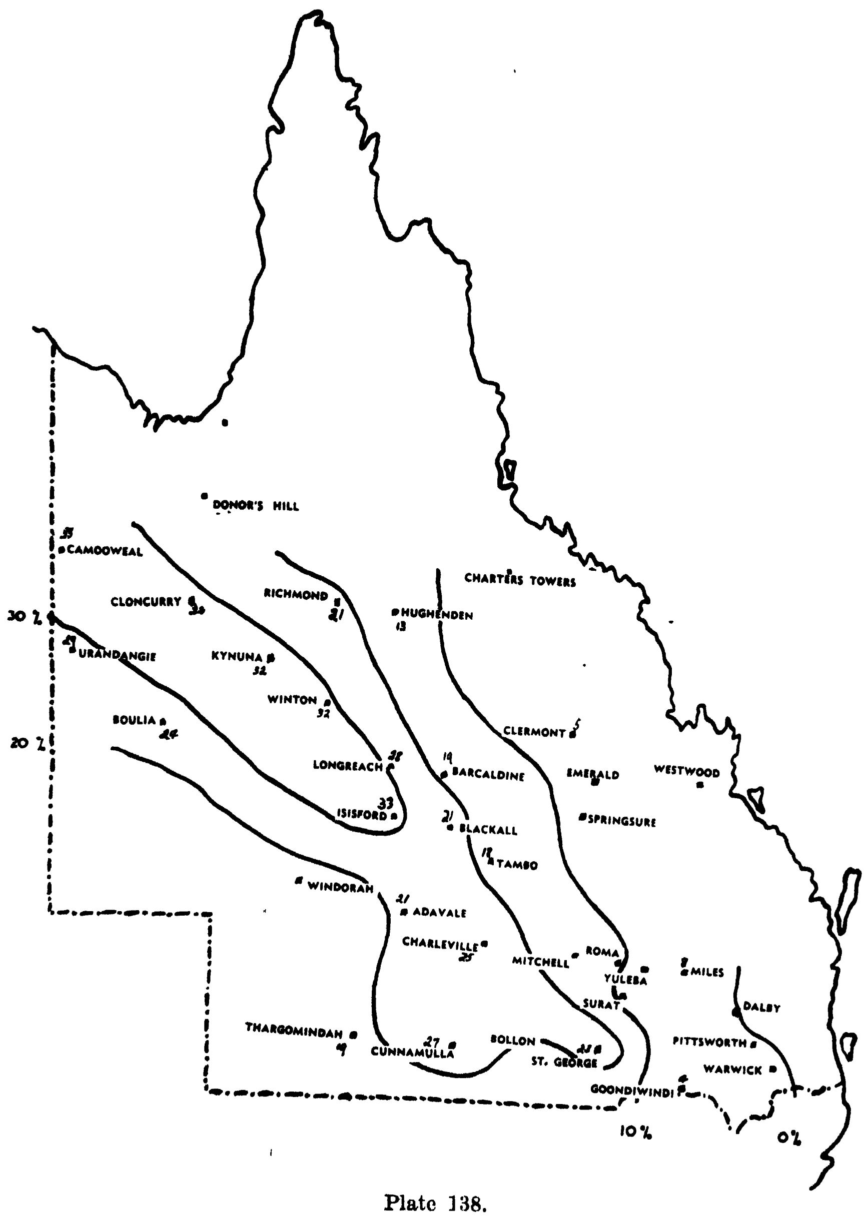


Plate 138.

SHOWING THE PERCENTAGE OCCURRENCE OF MEDIOCRE YEARS IN THE PASTORAL AREAS. (For key, see p. 358.)

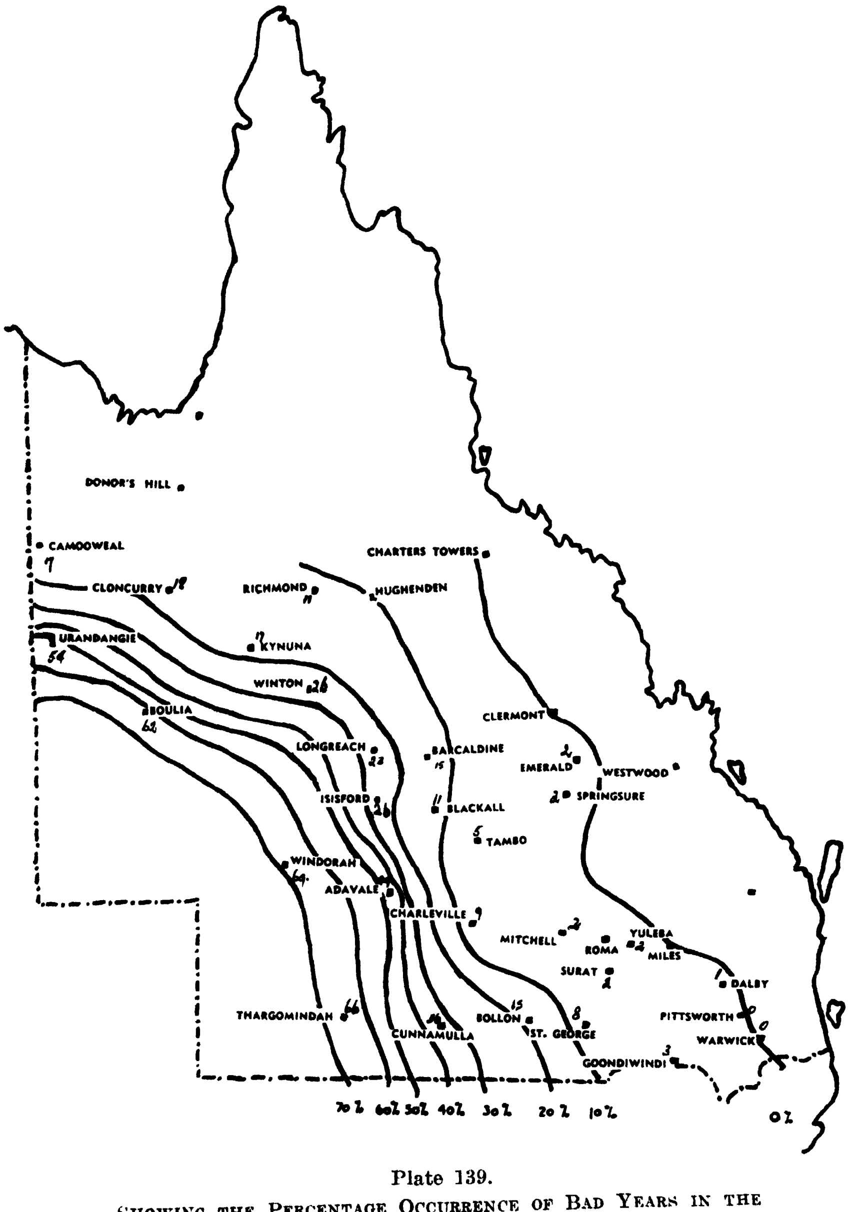


Plate 139.

SHOWING THE PERCENTAGE OCCURRENCE OF BAD YEARS IN THE PASTORAL AREAS. (For key, see p. 358.)

Further south the Cunnamulla district is interesting in that its winter rain is more reliable than its summer rain. The greater part of the Maranoa, however, receives two months of effective rain in both the summer and the winter. The area between Goondiwindi, Dalby, and Surat and extending up to the central highlands at Emerald and Clermont receives four months summer rain or two months winter rain in at least 66 per cent. of the years.

The seasons have been classified as good to fair, mediocre and bad for sheep raising, depending upon the occurrence and distribution of effective rain. The percentage occurrence of these seasons has been calculated and maps have been drawn to show the parts of the State which enjoy the seasons of the various types.

Plates 137, 138, and 139 show the main sheep-raising areas of the south-west and north-west and parts of the central-west in a rather unfavourable light. In the south-west the top feed provided by the heavy growth of mulga makes an important contribution to the safety of the district but in the north-west and that part of the central-west where there is no top feed the majority of the seasons are inclined to be either mediocre or bad. The large proportion of mediocre and bad seasons which occur at Winton makes it difficult to maintain reasonably good lambings in that district.

The occurrence of average maximum monthly temperatures has also been studied, as hot weather has an adverse effect on the quality of the semen produced by rams.

Plate 140 shows the number of months each year in which the average maximum temperatures are over 95 deg. F. This shows a peculiar closed area around Winton, Richmond, and Kynuna in which the average maximum temperatures are 95 deg. F. or over from November to April. This hot area shows a strong tendency to extend towards Camooweal and Urandangie. A comparison between all maps shows that the area which experiences the prolonged summer heat corresponds with a large part of the State which has a high proportion of mediocre seasons. In addition the period of high temperatures corresponds with the occurrence of summer rain.

Key to Plates 137, 138, and 139.

These maps show the percentage occurrence of good to fair years, mediocre and bad years respectively.

The classification was made as follows:—

—	Good to Fair.		Mediocre.		Bad.	
	Months of Summer Rain.	Months of Winter Rain.	Months of Summer Rain.	Months of Winter Rain.	Months of Summer Rain.	Months of Winter Rain.
Northern Stations	4	+ 2	2 (late)	+ 0	2 (early)	+ 0
	4	+ 0	0	+ 6	0	+ 2
	2 (late)	+ 2	0	+ 4	0	+ 0
	6	+ 0	2 (early)	+ 2		
Southern Stations	4	+ 2	4	+ 0	2 (early)	+ 0
	2 (late)	+ 2	0	+ 4	0	+ 2
	6	+ 0	2 (late)	+ 0	0	+ 0
	0	+ 6	2 (early)	+ 2		

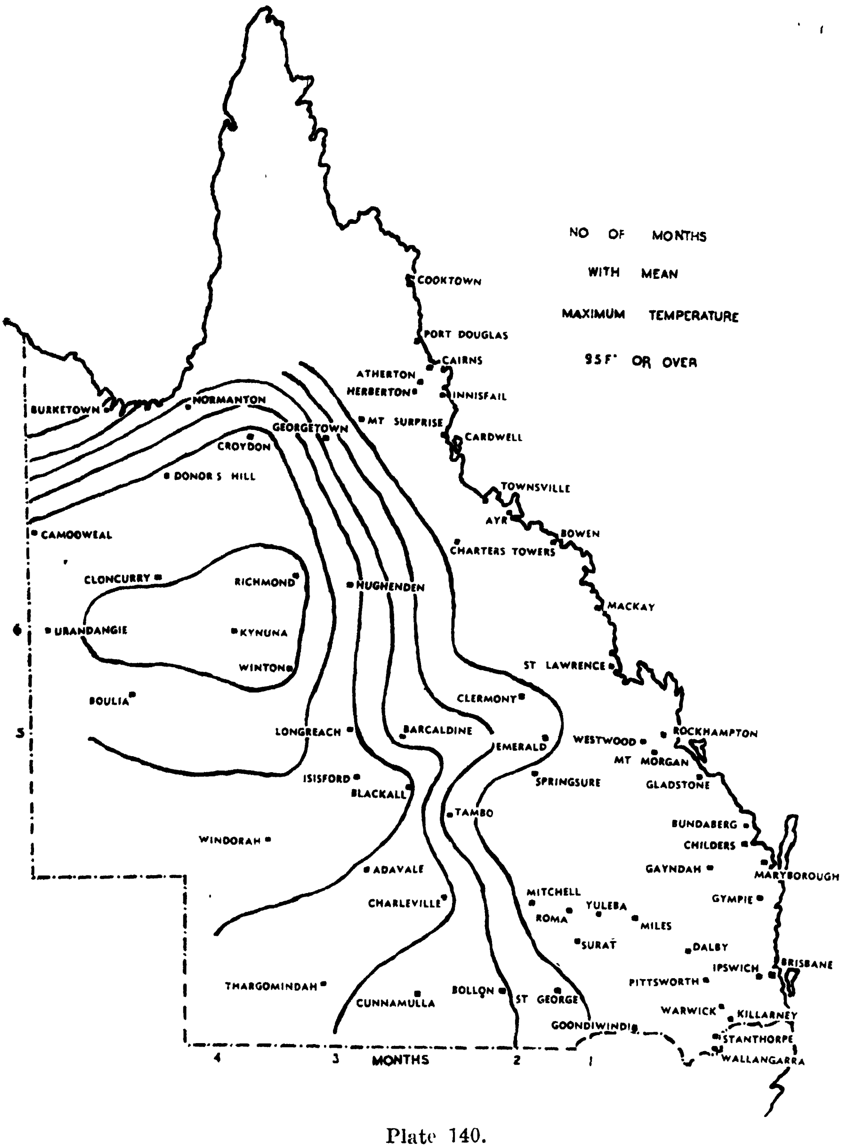


Plate 140.

Plate 141 shows the occurrence and distribution of the main types of vegetation in pastoral Queensland. An appreciation of these maps and the differences they connote is important in planning for lambings in Queensland. For example, allowance has to be made for the capacity of Mitchell grass to last, more or less as "hay on the stem," and this may counteract to some extent the "mediocre" seasons which occur in the central aras. Owing to the prolonged hot weather in the Richmond-Kynuna-Winton area the feed can go off earlier than in the cooler areas. Consideration has also to be given to the occurrence of top feed from mulga in the Charleville-Cunnamulla-Bollon areas and the mixture of country at Dirranbandi.

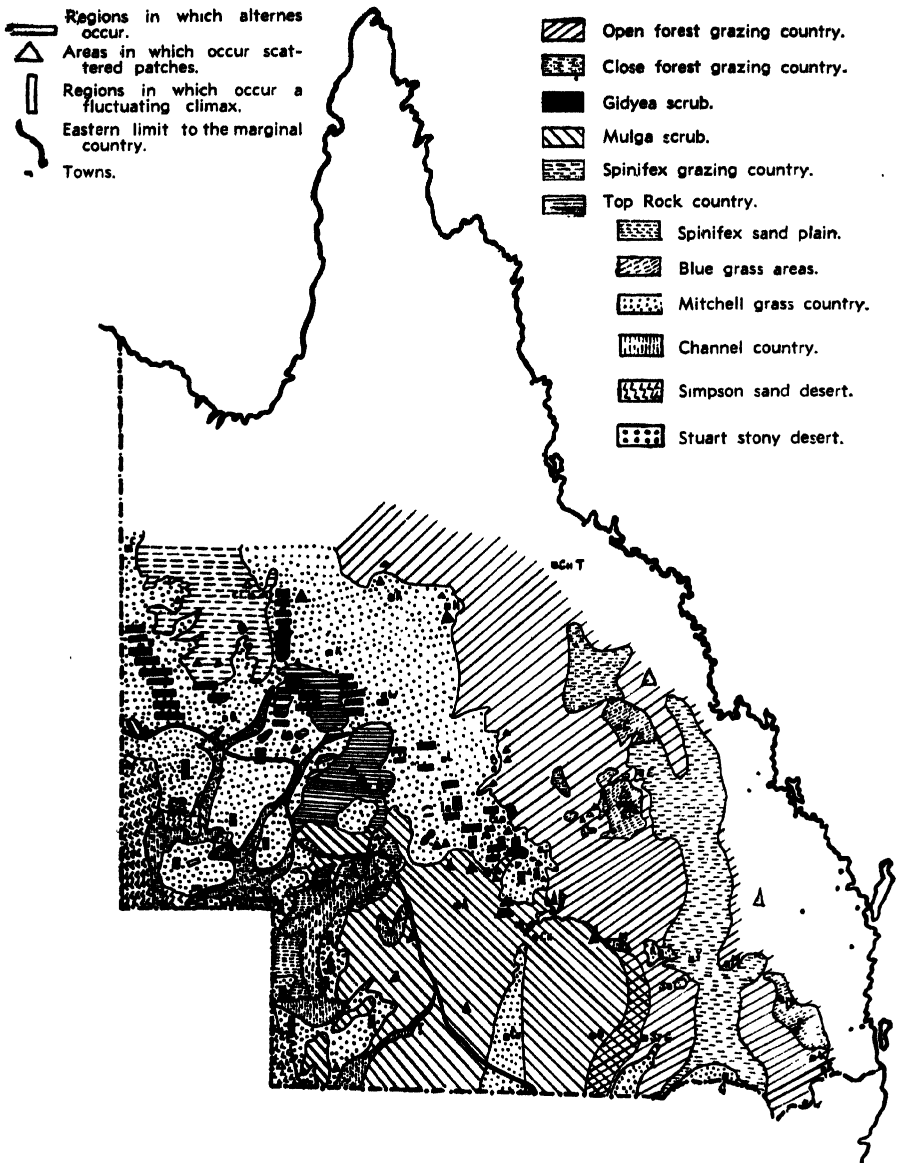


Plate 141.
WESTERN VEGETATION.

The Care of Rams.

It is clear from the section dealing with the fertility of rams that the first essential is to use animals which are enjoying normal sexual health.

This means that care should be used in selecting rams for purchase. An examination should be made of the scrotum and its contents. This can be done with the ram on his feet or he may be "turned up" for a closer inspection.

The scrotum should be palpated, commencing at the "neck," where a careful examination is made of the cords for the presence of varicocele and for any sign of a hernia. The hands are then moved down over the testicles and their size and resilience gauged. They should be manipulated through the hands to note any unevenness, swelling or adhesions to the scrotum itself. Finally the epididymis should be examined carefully just at the tip of each testicle and at the back of the testicles towards their upper end. Any unevenness in size or departure from the normal shape should be regarded with suspicion.

It is as well to remember that changes in the resilience of the testicles, provided they are similar in each gland, are not necessarily indicative of permanent sterility.

Wastage amongst rams is probably higher than most flock-masters recognise. Even if rams enjoying normal sexual health are purchased, some animals are likely to suffer each year from one of the diseases capable of producing permanent sterility. This means that it is advisable to go through the rams each year before joining and reject any which are likely to be suffering from diseases likely to render them wholly or temporarily infertile. *Casting rams on their mouth or age mark alone is not enough.*

Important aspects of the preparation of rams for joining include keeping them cool and giving them the correct feed. As increased body temperatures are likely to render rams comparatively infertile it is essential to muster or move them during the cooler part of the day; that is, during the early morning or late afternoon. The provision of adequate shade for rams greatly assists in maintaining fertility when they are exposed to the high atmospheric temperatures, which occur during the summer months in a large part of north-western Queensland. If shade trees are not available it is well worth the trouble and effort of making thatched shades.

As it may take some weeks for rams to recover from the seminal degeneration brought about by a deficiency of vitamin A, the procedure adopted on so many properties of joining after summer rains does not give the rams sufficient time to reach a reasonably high level of fertility. A prolonged dry spell, so often experienced in central and north-western Queensland, could be counteracted by feeding the rams a supplementary ration rich in vitamin A and protein for six to eight weeks prior to joining. Just throwing the rams a little lucerne or maize each day is not enough. If the rams are to be prepared properly their feeding should be carefully planned. There is considerable evidence to suggest that the formation of calculi (which are stones or gravel in the bladder) may be governed by the food available to the rams. This makes it very essential that advice should be obtained on the feeding of rams prior to joining, or a proprietary ration especially designed for the purpose may be used.

Shearing the rams as frequently as is practicable minimises the risk of fly strike and probably assists in keeping the sheep cool. It is not advisable to mate rams which have been recently struck by blowflies or which have suffered from a suppurating sore. In addition rams should not be dipped in or jetted with arsenical fluids for some weeks prior to joining.

It is always advisable to trim the feet of any rams which require attention prior to joining.

Joining.

The choice of joining time is important and seasonal conditions must be the first consideration. The two points to consider are:—

(i.) What joining time will give the maximum chance of survival of the lambs and their mothers?

(ii.) At what time of the year will the greatest numbers of ewes be coming on heat and when will the rams be at their maximum fertility?

In a large part of Queensland it is difficult to fulfil both these these requirements. This is specially true of the Mitchell grass downs country in the greater part of central and north-western Queensland. Mating ewes to lamb after the summer rains is a hazardous procedure, unless relief country is available, because of the unreliable nature of the rainfall. It also means that the majority of the ewes may not be on heat and the rams may be suffering from temporary infertility on account of the hot weather. On the other hand, an autumn mating may mean that a large number of ewes conceive, but surface water dries up and the plane of nutrition falls as the winter progresses. This means that there is a considerable risk of heavy losses from pregnancy toxaemia and the chances of survival of the lambs are lowered.

Generally little attention is paid to the selection of ewes because of fertility, but the capacity of British breeds (particularly the long wools and their crosses) to bear twins should be considered by fat lamb producers in selecting ewes as lamb mothers.

Infertility of ewes due to disease conditions is not as common as amongst rams. In addition, infertility of a few ewes has not the same importance as that affecting rams. If one ram is infertile it may mean that thirty to forty ewes do not get in lamb.

In selecting ewes for joining it is as well to consider their previous breeding record. Obviously fat lamb breeders will cull out any ewes which have failed to produce a lamb in the previous year as well as those which have blind teats as the result of shearing wounds or mastitis. Usually the detailed history of flock Merino ewes is not well enough known to allow for the rejection of animals with a poor breeding record. In stud work, however, where close records are kept it is possible to cull out young ewes which fail to lamb during their first two seasons.

It is often considered preferable to join the rams when the ewes are on green feed, but the exact time must be decided by the property owner. Full cognizance must be taken of such factors as the seasonal conditions, the occurrence of grass seed, the available top feed, and the property improvements. In the Warrego and Maranoa, where the rainfall is better distributed and where there is more top feed, it is easier to follow a policy with regards to mating at a certain time each year and it is probable that a March, April or May joining in these areas is likely to be attended with considerable success.

In the north-west and the upper central districts the choice between a spring or autumn joining will depend upon whether the property owner has relief country or is prepared to take a risk of summer

rains falling, which will ensure a low mortality rate of ewes and rapid growth of lambs, or if he wishes to play as safely as possible. He must realise he can still lose heavily through a high mortality rate amongst ewes and lambs.

If the rams are in good sexual health, between 2½ per cent. and 3½ per cent. should be sufficient to join with the ewes. In view of the apparent ability of rams to stimulate oestrus amongst ewes which have not been joined for some time, it is advisable to join the rams in two drafts. The first 1½ per cent. or 2 per cent. of rams might be joined and these can be followed about 15 days later by the remaining 1 per cent. or 1½ per cent. Such a procedure would mean that there were fresh rams available to serve the increasingly large number of ewes coming on heat.

Six to eight weeks is sufficient time for joining. The shorter period would give the average ewe a reasonable chance of experiencing a second heat period if she did not mate successfully during the first one. A short joining has an advantage, too, in that it reduces the spread of ages of the lambs and this helps to minimise losses at marking time. It is advisable to cull any ewes which fail to conceive during two consecutive breeding seasons, or which have malformed udders or blind teats.

During joining it is essential to keep a careful check on the rams and to watch for any which become fly-blown or disabled. It is advisable to ride through the flock every few days and pick up a few ewes and move them along quietly to another group which is with a ram. Some men yard the ewes once or twice a week. This may make the wool dusty, which is a disadvantage.

The Care of In-lamb Ewes.

Careful attention given to ewes which are in lamb can pay handsome dividends in the form of increases in the percentage of lambs marked to ewes mated. Protection of ewes from blowflies is extremely important, as is seen from the following table:—

FERTILITY OF EWES—STRUCK AND UNSTRUCK.

Ewes.	Percentage Wet.	Percentage Lambs.
Struck	75	79
Unstruck	92	100

EFFECT OF MULTIPLE STRIKES ON FERTILITY.

Number of Strikes.	Percentage Ewes Wet.
0	92
1	88
2	73
3	58
4	47

In these particular experiments the ewes were protected by the Mules Operation and the increases in the number of ewes which conceived, as well as in the number of lambs reared, were an important benefit derived from blowfly control. The Mules Operation is just as essential as lamb-marking and when ewes have been treated the usual procedure is to join soon after shearing or crutching. Under these circumstances they require very little special attention during the first three months of their gestation.

As the nutritive requirements of ewes which are in-lamb increase fairly rapidly during the last two months of pregnancy, it is desirable, where possible, to keep the ewes on a rising plane of nutrition during this period. In view of the seasonal conditions in the pastoral areas this is often impossible, particularly if the rams have been joined after the summer rains. However, good management includes arranging stocking rates and water facilities so that the ewes have conditions which are as good as are practicable during the last two months prior to lambing. In the central-west and north-west it is often advisable to feed a supplement to ewes which are due to lamb in the late winter or spring. A suitable mixture consists of equal parts of finely ground limestone, coarse salt, and some protein-rich meal such as meatmeal, linseed meal, cottonseed meal, or even ground grain sorghum. The whole can be bound with diluted molasses and fed at the rate of 1 to 2 oz. per head per week.

If the ewes have been joined off-shears they should be crutched about one month prior to lambing. During these operations care should be taken to see that the ewes are not subjected to long periods of starvation by being left in the yards over-long, and it is sometimes inadvisable to drive ewes which are advanced in pregnancy long distances. Such treatment may induce milk fever and/or pregnancy toxaemia.

The Survival of Young Lambs.

There is ample evidence of heavy wastage of young lambs. Mortalities can be particularly high between birth and marking and between marking and weaning. Good management aims at preventing these losses. It is well known that the best lambing figures are obtained in the paddocks which have the greatest amount of shade and the most evenly distributed watering facilities. In addition, better results are obtained if the lambing paddocks are small. This minimises unmothering. It is as well to use such paddocks for lambing whenever possible.

Extremely hot weather can easily cause heavy mortalities amongst lambs, particularly if they are called upon to travel long distances when their mothers are in search of food and water. Accordingly, the likelihood of a heat wave occurring when the ewes are lambing has to be considered, particularly by sheep-raisers in the north-west, where the country is so open.

Heavy losses can occur after lamb-marking as the result of unmothering lambs and/or from marking wounds becoming infected with virulent bacteria capable of setting up such diseases as gas gangrene, malignant oedema, white oedema, tetanus, or arthritis. These have been described and their control measures discussed in a Departmental pamphlet.

Mothering is an important part of lamb-marking. Various methods are used but the basic principle to adopt is to keep the whole flock moving in the same direction. This minimises confusion and seems to make it a good deal easier for lambs to find their mothers.

CONCLUSIONS.

It is impossible to make a general recommendation which will fit the whole of Queensland. The main points to consider are:—

(i.) Buy rams enjoying normal sexual health;

(ii.) Examine the rams each year prior to joining and remove those which are likely to be infertile because of some disease affecting the genital organs;

(iii.) Prepare rams carefully for joining by—

(*a*) Keeping their wool short;

(*b*) Providing them with shade if the weather is hot;

(*c*) Avoiding the use of arsenic as a dip or for jetting;

(*d*) Feeding them a suitable supplement rich in vitamin A and protein for six to eight weeks prior to joining.

(iv.) In deciding upon joining time take cognizance of—

(*a*) Climatic conditions of the district in which the property is located;

(*b*) The type of pasture and amount of top feed available on the property;

(*c*) The nature and distribution of the water facilities and the occurrence of surface water;

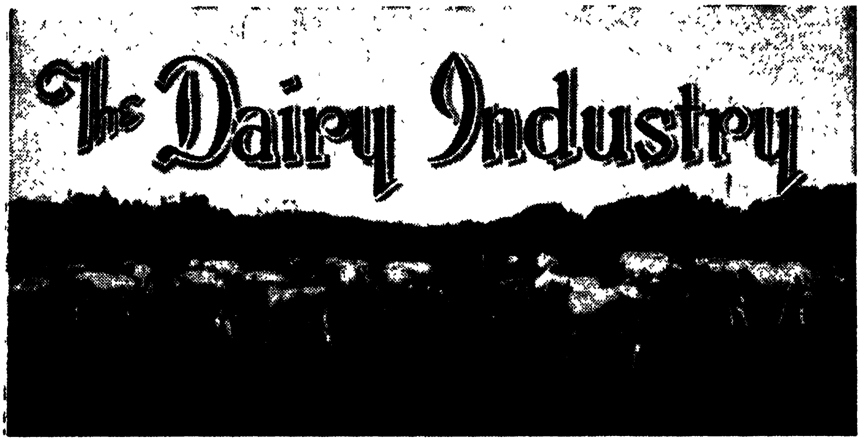
(*d*) The incidence of oestrus in the ewe flock;

(*e*) The occurrence of any other factors which should be considered, such as grass-seed or market requirements.

Acknowledgments.

In preparing this article, information already published by Dr. Kelley, of C.S.I.R., and Dr. Gunn, of the University of Sydney, has been drawn upon freely.

A large part of the studies in Queensland's climatology was suggested by Mr. S. L. Everist, and the computations were made by Joan N. Farmer (Mrs. A. McLellan). Appreciation of their assistance and permission to draw upon hitherto unpublished data is recorded.



Farm Water Supplies and Their Treatment.

F. G. FEW, Dairy Technologist, Division of Dairying.

A GOOD and ample supply of water is one of the most tangible assets with which any dairy farm can be endowed. Plenty of water is required for the watering of all farm stock; irrigation of crops, grown as a major farm activity or for some special reason, such as the feeding of stock; essential farm purposes, such as washing and cleansing operations on dairy farms; and, of course, for domestic uses in and around the farm home.

Usual sources are—surface water including river, creek, lagoon or artificial dam; underground water, such as from artesian or sub-artesian bores or wells; and rain water collected from the farm buildings.

No Treatment for Stock or Irrigation Waters.

Irrespective of the source of supply, no treatment is practicable in the ordinary way for water for stock or for growing crops. The particular water is either suitable for the purpose intended, or has deleterious effects if so used. Chemical analysis is the usual method of determining the suitability of a water for stock or irrigation, together with a knowledge of relevant local factors which may widen or restrict its use. Therefore, the Agricultural Chemist requires particular details when a sample of water is sent for analysis. These are considered, together with the analytical results on the sample of water submitted, in deciding on the suitability of the water supply. Generally, stock are more tolerant in respect of the quality of water than crops or other water usages. Most surface waters and many underground sources prove satisfactory for stock, while surface waters are often the only supply of value for irrigation purposes.

Domestic and Cleansing Purposes.

For domestic uses, the housewife is likely to find many surface waters and most underground waters somewhat unsatisfactory, particularly for laundry and general cleansing purposes. Similar remarks apply

to the use of such waters for essential farm cleansing, the twice-daily washing up routine on the dairy farm being a case in point. A general complaint is that the water is too hard for easy and efficient cleansing because of its not lathering well with soaps or other cleansing agents. Water hardness is a result of dissolved mineral salts, mainly of lime and magnesia. Consequently hard waters are wasteful of soap and cleansers and are often unsatisfactory because of the greasy scum arising from the interaction. As a general rule, surface waters increase in hardness as we pass from dam to river, the dam water generally being quite soft although less so than tank rain water. Bore and well waters are usually much harder, although, of course, there are many exceptions to this rule. Another very common objection to the farm water supply for domestic and cleansing purposes is suspended matter, fine clay and organic matter being the chief troubles. This difficulty is more prevalent in surface waters than in those from underground sources, but, of course, exceptions again occur.

Clarification.

Rain water free from both troubles is thus the best for domestic and cleansing purposes on the farm. The only difficulty is sufficient storage during wet weather to last over dry spells. Compatible with a reasonable outlay, however, every effort should be made to utilise all available roof catchments to achieve this end. In the heavier rainfall areas provision can be made for all requirements by having proper water holding facilities. As rain water is so valuable for washing, it should not be needlessly wasted. Because of many circumstances, however, the natural supply is often the only water available for use and the treatments frequently necessary can now be outlined.

The removal of suspended clay or other matter is absolutely essential for efficient washing or general domestic uses. The usual method is to treat the raw water with a small dosage of sulphate of alumina or an allied chemical and allow the water to stand for some hours, overnight for preference. For dairy farms 1,000 gallons of water should be enough for all normal cleansing requirements for one week.

As sulphate of alumina gives an acid reaction in water, it is necessary to neutralise this with soda ash or slaked lime, the former for preference, for laundry purposes. The tank is fitted with a sludge-drain cock at its lowest level and also a drain-off tap some 4 to 6 inches above the base of the tank. The water intake for this drain-off tap should turn upwards to avoid sludge being drawn off with the water. A treatment tank can with advantage be concreted and should be open on top and situated on ground level for convenience. The method of treatment is to fill the tank with raw water and add the necessary chemicals first dissolved in, or mixed to a slurry, with a small quantity of water in a bucket. A wooden paddle worked by hand is quite satisfactory for mixing, provided the tank is not too large, although mechanical stirring can be arranged if so desired. After settling, the clear water is drawn off from the higher tap and the sludge washed out of the tank through the sludge cock. The clear water is then pumped to an elevated storage tank for reticulation by gravity for dairy or domestic uses.

Softening.

Water which is unsatisfactory because of hardness may likewise be treated in tanks to soften it. The same tanks as described for water clarification can be used, the only difference in treatment being the chemicals added. Freshly slaked lime is the main softening agent, used either alone or with soda ash, depending on the dissolved salts causing the water hardness. The technique of treatment is the same as for water clarification, and if both are required, softening is generally done after removing the sludge from the first process. The treatment outlined will not soften the water entirely, and it is the general practice to offset the residual hardness by adding a small amount of a soluble chemical known as sodium hexametaphosphate. This can be done in the high level storage tank, or in the treatment tank if all sludges can be first readily removed. The resulting water will prove suitable for all washing and cleansing purposes, will obviate soap and cleanser wastage and, largely, the deposition of milkstone in cans and milking machines. For many waters, treatment with the soluble phosphate is all that is necessary and this is a very simple procedure.

Testing Waters.

In every case where rain water is not available, a checkup on the water supply in use is strongly recommended. Samples forwarded to the Under Secretary of the Department of Agriculture and Stock can be analysed with a view to deciding an appropriate treatment for each individual case. A representative sample in a clean beer bottle is sufficient for analysis, but for clarification or softening treatment a sample of at least one gallon is required.

Milk Cooling on the Farm.

F. G. FEW, Dairy Technologist.

DURING the four months from January to April of this year tests were carried out to determine the efficiency of milk-cooling on various farms in the Dayboro district. This was made possible through the purchase of two sling psychrometers by the Brisbane Milk Board for use in the field. The results given here are those obtained by Mr. A. Hutchings, Field Officer, Brisbane Milk Board.

The sling psychrometer is simply an instrument by which the existing wet-bulb temperature can be observed quickly and accurately under field conditions. Using evaporative cooling, either in one form of application or another, the existing wet bulb temperature is the lowest to which milk or water can be cooled. This means that without refrigeration no temperatures below wet-bulb can ordinarily be observed on farms, and the cooling efficiency is measured by the deviation from this temperature. A provisional standard has been set whereby satisfaction can be claimed if the milk temperature in the can does not exceed the existing wet-bulb temperature by more than 5° F.

Three different systems for milk cooling were tested, particulars of which are as follows:—

(1) A blower type of cooler in which the descending milk is caught in an upward draught of air provided by a fan. This results in a fine spray of milk within the enclosed cylinder situated above and, after falling, the milk is discharged directly into a can.

(2) A water-cooling tower system using re-circulated water for cooling the milk on a tubular surface cooler. Full particulars of this design were published in this Journal for May, 1946.

(3) Water re-circulated from a suitable storage tank through a tubular surface cooler, no provision being made, however, for the evaporative cooling of the water itself.

The results obtained are given in the accompanying table.

Date.	Location.	Time.	Wet-bulb Temperature.	Milk Temperature in Cans.	Deviation from Theoretically Possible Temperature.	Remarks.
8 1 48	Farm A, Mount Pleasant	5-6 a.m	61 66° F.	79 82° F.	17° F.	Blower-type cooler used
22-1-48	Farm B, Mount Mee	6 a.m.	66° F.	76° F.	10° F.	Locally made tubular milk cooler in use. Water recirculated from adjacent 1,000 gallon tank, but not subjected to evaporative cooling
22-1-48	Farm C, Mount Mee	6.30 a.m.	66° F.	76–82° F.	13° F.	Blower-type cooler used
22-1-48	Farm D, Mount Mee	7.30 a.m.	66° F.	76° F.	10° F.	Blower-type cooler used
11-3-48	Farm E, Lacey's Creek, Dayboro	4 p.m.	72° F.	75–76° F.	3 5° F.	Water-cooling tower system in use
12-4-48	Farm F, Armstrong Creek	3.30 p.m.	73° F.	76° F.	3° F.	Water-cooling tower system in use
20-4-48	Farm E, Lacey's Creek, Dayboro	7 a.m.	52° F.	58° F.	6° F.	Water-cooling tower system in use. Temperature of water off tower was 52° F.
20-4-48	Farm G, Lacey's Creek	7.30 a.m.	52° F.	66° F.	14° F.	Blower-type cooler used
27-4-48	Farm H, Lacey's Creek	6.45 a.m.	65° F.	67° F.	2° F.	Water-cooling tower system in use
27-4-48	Farm E, Lacey's Creek	7 a.m.	65° F.	67° F.	2° F.	Water-cooling tower system in use
27-4-48	Farm G, Lacey's Creek	7.30 a.m.	65° F.	76° F.	11° F.	Blower-type cooler used

The table shows that in the five tests made on the blower type of cooling system satisfactory results were not achieved in any of the installations; the water-cooling tower system gave satisfaction in four out of the five tests made; while the one water tank system failed to qualify.

It is proposed to make regular tests on all cooling devices in use on farms as opportunity offers. This will be done in as many districts as possible and extending over all months of the year. Results will be published as they become available for the information of farmers interested in this important aspect of quality production on the farm.

PRODUCTION RECORDING.

List of cows and heifers tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S., Jersey, Guernsey, and Ayrshire Societies' Herd Books, production records for which have been compiled during the month of May, 1948. (273 days unless otherwise stated.)

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (STANDARD 350 LB.).				
Glen Idol Daphne 4th	Estate P. Doherty, Gympie	13,061	595·387	Blacklands Count
Rhodesview Beauty 20th	W. Gierke and Sons, Helidon	11,697 75	556·227	Fairvale Major
Ennismore Bud 2nd	E. W. Jackson, Nobby	11,669 1	473·721	Navillus Prince Henry
Chelmer Maureen	H. F. Marquardt, Wondai	12,496 8	458·951	Hillview Daphne's Elect
Ennismore Remona 2nd	E. W. Jackson, Nobby	11,046·95	428·196	Navillus Prince Henry
Mountain Home Ivy 4th	Queensland Agricultural High School and College, Lawes	9,970·15	426·646	Sunnyview Alert
Jamberoo Grace	A. E. Ezzy, Milmerran	9,451·3	409·781	Brookland Terrace Banker
Ennismore Rose	E. W. Jackson, Nobby	9,817·85	361·114	Navillus Prince Henry
SENIOR, 4 YEARS (STANDARD 330 LB.).				
Navillus Charm 17th	C. O'Sullivan, Greenmount	11,985·3	447·873	Greyleigh Eros
Sunnyview Beauty	K. Berghofer, Athol	9,004·66	374·777	Sunnyview Envoy
Chelmer Star 2nd	H. F. Marquardt, Wondai	9,490·3	362·501	Chelmer Champion's Renown
JUNIOR, 4 YEARS (STANDARD 310 LB.).				
Blacklands Lady Gentle 10th	A. Pickels, Wondai	8,944·7	385·356	Blacklands Gar
Yarranvale Fussy	K. Berghofer, Athol	9,454	384·254	Sunnyview Royal National
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Sunnyview Beauty 6th	J. Phillips and Sons, Wondai	16,577 9	733·237	Sunnyview Commodore
Fairvale Doris 7th	W. Henschell, Yarranlea	14,035·75	547·284	Bingleigh Jeans Monarch
Fairvale Minerva 3rd	W. Henschell, Yarranlea	11,152·89	420·667	Bingleigh Jeans Monarch
The Coral's Louie 5th	A. H. Webster, Helidon	9,740 7	393·309	Blacklands Herdsman
Bunya View Dulcie 2nd	K. Berghofer, Athol	8,255·02	338·962	Trevor Hill Reflection
Glen Idol Colleen 2nd	Estate P. Doherty, Gympie	8,784·75	337·146	Blacklands Banker
Mountain Home Gem 61st	M. C. Lester, Glengallon	9,095·4	334 429	Fairvale Ensign
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Sunnyview Thelma 14th	J. Phillips, Wondai	13,731·8	665·037	Sunnyview Commodore
Evermoor Fay	W. A. Freeman, Rosewood	15,414·05	605·725	Frenchview Park Lad
Treviac Vision	W. A. Freeman, Rosewood	13,598·8	553·32	Treviac Rosettes Combination
Mountain Home Envy 3rd	A. H. Webster, Stockyard Creek	9,163·8	369·56	Fairvale Ensign
Ardilea Princess 2nd	Hinricksen and Sons, Clifton	8,177·15	337·575	Newstead Reliance
Ardilea Broady 13th	Hinricksen and Sons, Clifton	6,789·15	315·112	Newstead Reliance
Lynfield Ida 4th	D. Birch, Memerambi	7,498·45	274·848	Parkview Ransom

AUSTRALIAN ILLAWARRA SHORTHORN.

SENIOR, 2 YEARS (STANDARD 250 LB.).

Fairvale Myrtle 5th	W. Henschell, Yarranlea	11,035·72	433·884	Bingleigh Jeans Monarch
Lynfield Fidget 3rd	F. E. Birt, Gympie	7,911·35	342·628	Parkview Ransom
Blacklands Lily 15th	A. Pickels, Proston	8,495·2	338·406	Blacklands Carnations Prince
Rhodesview Kitty 28th	W. Gierke and Sons, Helidon	7,898·2	297·682	Alfa Vale Nigel
Rosenthal Perfect 16th	S. J. Mitchell, Warwick	7,125·4	289·323	Rosenthal Lilac 4th Emblem
Glen Idol Daphne 22nd	Estate P. Doherty, Gympie	7,205·2	274·653	Glen Idol Coronet

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Navillus Tiddlewinks 11th	C. O'Sullivan, Greenmount	9,354·8	371·774	Parkview Limerick
Bunyaview Thelma's Pride II.	W. D. Davis, Wambo	7,120·8	321·869	Trevor Hill Progress
Rhodesview Royal Primrose 6th	W. Gierke and Sons, Helidon	7,690·15	311·402	Alfa Vale Nigel
Millievale Stella	A. H. Webster, Stockyard Creek	6,961·2	284·005	Woodville Viscount
Ardilea Princess 4th	Hinricksen and Sons, Clifton	6,770·8	272·391	Newstead Reliance
College Queenie 6th	Queensland Agricultural High School and College, Lawes	5,966·9	260·034	Alfa Vale Pride 3rd
Yarranvale Fussy 2nd	K. Berghofer, Athol	6,685·72	250·788	Sunnyview Royal National
Palmetto Diana 3rd	R. Tweed, Kandanga	6,439·20	242·202	Sunnyview High Caste
Fairvale Jean 15th	K. Berghofer, Athol	6,454·54	238·763	Fairvale Red Prince

AYRSHIRE.

MATURE COW (STANDARD 350 LB.).

Benbecula Winalot	M. J. Brownlie, Nankwee	8,590·65	392·33	Benbecula Brian 2nd

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Myola Thistledown 2nd	J. P. Ruhle, Motley	6,440·1	287·072	Myola Perfection

GUERNSEY.

MATURE COW (STANDARD 350 LB.).

Laureldale Vida	W. A. K. Cooke, Witta	12,473·05	562 729	Minna Murra's Topsy's Sequel 2nd

SENIOR, 2 YEARS (STANDARD 250 LB.).

Laureldale Ethel	W. A. K. Cooke, Witta	8,013·7	418·449	Fernhill Searchlight

JERSEY.

MATURE COW (STANDARD 350 LB.).

Westwood Goldilocks	F. Porter, Cambroon	10,679·1	574·972	Hunstrete Emperor's Volunteer (imp.)
Trinity Princess Royal 2nd	J. Sinnamon and Sons, Moggill	9,291 15	561·775	Trinity Crowning Effort
Boree Promise	W. and C. E. Tudor, Gayndah	8,191 37	452·178	Maurfield Larkspur's Gift
Romsey Ginger Girl	J. Wilton, Killarney	8,843·1	448·126	Oxford Pixie's Victor
Westwood Sapphire	F. Porter, Cambroon	7,498·7	444·61	Westwood Palatine Volunteer
Trecarne Golden Dairy Girl 2nd	T. A Petherick, Helidon	8,539·95	439·683	Brampton Daffodil's Peer
Trinity Crowning Poppy	J. Sinnamon and Sons, Moggill	9,377·55	424·236	Trinity Crowning Effort
Boree Beauty	W. and C. E Tudor, Gayndah	9,644·91	397·647	Boree Soldier Boy
Romsey Christmas Eve	J. Wilton, Killarney	7,025·6	394·023	Morago Rivoli Prince
Boree Charming Girl	W. and C. E. Tudor, Gayndah	8,761·75	393·954	Maurfield Larkspur's Gift
Bulby Magnet	T. W. Dennis, Beaudesert	6,651·9	363·917	Bulby Bobby's Boy
Avonview Cute Fern	T. W. Dennis, Beaudesert	7,058·8	357·711	Trinity Cute Ruler
Strathdean Tiny	A. S. Grant, Greenwood	6,722 05	353·316	Strathdean Amber's Ruler

PRODUCTION RECORDING—*continued.*

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
SENIOR, 4 YEARS (STANDARD 330 LB.).				
Trinity Princess Rose	J. Sinnamon and Sons, Moggill	10,761·5	600·635	Trinity Lily's Lad
Ashview Lady 2nd	C. Huey, Sabine	6,657·00	409·289	Trecarne Victor 4th
Romsey Bonny	J. Wilton, Killarney	6,858·9	373·172	Oxford Pixie's Victor
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Trinity Effort's Royal	J. Sinnamon and Sons, Moggill	8,464·35	467·581	Trinity Crowning Effort
Trinity Poppy's Delight	J. Sinnamon and Sons, Moggill	7,415·05	382·011	Samares Cute Prince 3rd
JUNIOR, 3 YEARS (STANDARD 270LB.).				
Glenrae Seaflower	V. Granger, Nerang	6,343·75	425·764	Oxford Dark Victor
Inverlaw Lucy's Queen	R. J. Crawford and Sons, Kingaroy	6,049·7	419·43	Oxford Royal Lad
Austral Park Chance	A. Semgreen, Coolabunia	7,282·35	361·572	Austral Park Coronation Oxford
Lawnview Daisy	W. A. Berderow, Fairney View	6,022·1	312·281	Oxford Maxie
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Westwood Melba	F. Porter, Cambroon	7,382·45	438·170	Trecarne Golden King 2nd
Trinity Cute Princess 2nd	J. Sinnamon and Sons, Moggill	8,306·70	431·205	Samares Cute Prince 3rd
Trecarne Jersey Queen 8th	T. A. Petherick, Lockyer	6,185·2	348·891	Trecarne Some Duke
Westwood Valicare	F. Porter, Cambroon	5,274·7	306·049	Trecarne Golden King 2nd
Connemara Mistress Gay	J. Ahern, Conondale	4,936·75	298·157	Glenview Lochiel
Pinegrove Bella	J. W. Evans, Tallegalla	5,591·1	297·516	Roseview Peer
Lawnview Vita	W. A. Berderow, Fairney View	5,293·25	280·515	Oxford Maxie
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Glenrae Melody	S. Granger, Nerang	6,027·6	354·007	Brampton Bandmaster
Boree Cute Petal	W. and C. E. Tudor, Gayndah	7,612·26	353·621	Trinity Cute Commodore
Myrtledale May Queen	H. Sigley, Jaggan	5,727·45	347·053	Palmridges Golden Victory
Boree Efforts Pandora	W. and C. E. Tudor, Gayndah	6,837·96	338·574	Trinity Daffodil's Effort
Romsey Fawn	J. Wilton, Killarney	5,602·3	325·58	Bellgarth Ruler 4th
Westbrook Tulip 133rd (233 days)	H. T. W. Barker, Oakey	5,458·8	301·264	Selsey Royal Standard
Inverlaw Royal Countess	R. J. Crawford and Sons, Killarney	5,816·45	290·845	Oxford Royal Lad
Kathleigh White Fern	H. T. W. Barker, Oakey	4,594·3	252·925	Oxford Daffodil's Victor
Gem Maple	J. W. Evans, Tallegalla	4,628·95	240·777	Gem Valour

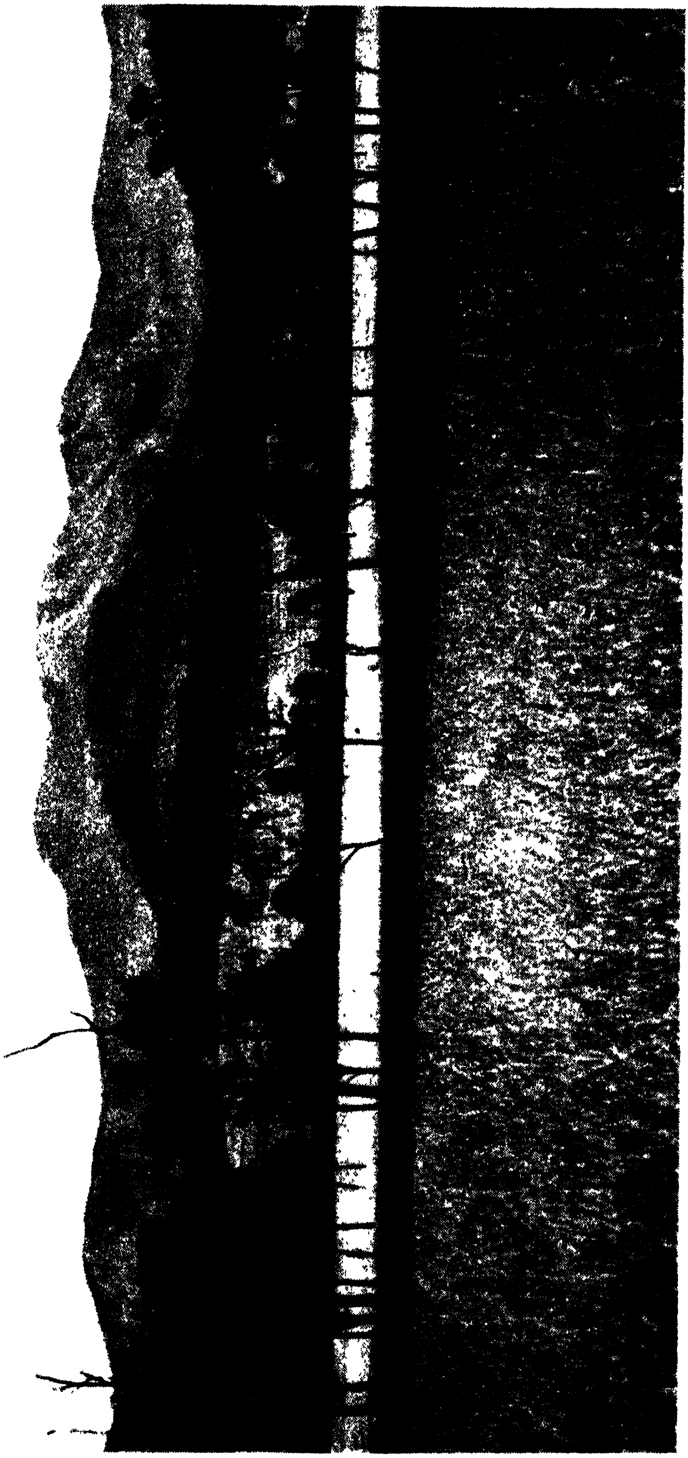


Plate 142.
THE GREAT DIVIDING RANGE FROM KINGPAH, WEST MORETON, SOUTH QUEENSLAND.

MARKETING

Production Trends—May.

In the dairying districts production is declining as herds are reaching the end of the lactation period, but it is considered satisfactory for this time of the year. The quality of milk and cream supplies is fairly satisfactory.

On the Darling Downs barley and oat crops are making good growth, and sowing of the wheat crop is under way. About 5,000 acres of linseed are expected to be planted on the Darling Downs this season.

On the Atherton Tableland harvesting of November planted maize is in full swing. The quality is generally good and the crop is expected to produce from 16,000 to 18,000 tons.

The latest estimate for the 1948 sugar crop is 5,600,000 tons of cane, and, should harvesting proceed without interruption, this figure is likely to be increased.

In the cotton growing areas it is expected that this season will produce less cotton than the previous season. A preliminary estimate by the Cotton Marketing Board for the 1948 crop is in the vicinity of 1,600 to 1,800 bales.

During May dry cool conditions were experienced throughout the pastoral areas, adding further to the serious plight of the industry in the Central Division, where stock are being moved on agistment from a number of properties in that area.

Crop Reporting and Forecasting Service.

The Crop Reporting and Forecasting Service initiated last year by the Division of Marketing of the Department of Agriculture and Stock has been considerably expanded over recent months. A commencement was made with the 1947 autumn potato crop and this was followed by the wheat crop and the 1947 spring potato crop. Maize and grain sorghum were added this year, and attention is being given now to the current wheat and barley crops.

The reports are based on information supplied by practical farmers in key centres of the growing areas who have undertaken to keep the Department informed on conditions in their own localities. Between 200 and 300 farmers are co-operating in this manner. The information is supplemented by reports from Field Officers and collated and analysed at the Head Office of the Department in Brisbane. The completed report is then distributed to radio stations, the press, interested farmers, produce merchants, banks, farm machinery firms, etc.

Comparisons of forecasts with official final figures show that the reports are substantially accurate, considering the largely experimental nature of the work. As an illustration of this a preliminary estimate of 10,000,000 bushels was made for the 1947-48 wheat crop and this was followed by a final forecast that the crop might reach 11,000,000 bushels. The actual production proved to be 10,500,000 bushels.

Denmark Fights Machinery Shortage.

The efforts being made by Denmark to overcome the effects of machinery shortage are described in "Farmer and Stock Breeder" of 10th February, 1948. In October, 1947, an Agricultural Committee was formed to organise a nation-wide net of tractor hire stations. This is now working satisfactorily. The Committee sends out teams of experts on periodical tours of inspection to find out what improvements are needed, to check performance on new types of machinery, and to receive first-hand information and suggestions from farmers. It is also aiming at importation of more fuel oil, more machinery (at reduced prices because of bulk purchase) and reduction of taxes by making money spent on hire of machinery deductible from income tax returns.

Ginger Board.

It was announced at the Department of Agriculture and Stock recently that the present growers' representatives on The Ginger Marketing Board, Messrs. G. O. Burnett, V. J. Crosby and R. P. L. Miller, all of Buderim, have been elected unopposed for a further term of three years commencing 16th July, 1948.

GENERAL NOTES

Ex-Servicemen and the Sugar Industry.

Referring to the settlement of ex-servicemen in the Sugar Industry the Minister for Agriculture and Stock (Hon. H. H. Collins) has announced that the Central Sugar Cane Prices Board had approved of apportionment of assignments to be granted under Part III. of *The War Service (Sugar Industry) Land Settlement Act of* 1946 in respect of the following:—

Assignments for land for landless men 156; for land-owners or option-holders 117; for increased assignments 122; for increased peaks 20.

Grade Herd Recording.

Approximately 4,000 cows were tested in six herd recording units conducted by the Department of Agriculture and Stock during the month of May. The best district average came from the newly established unit in the Oakey area. In this case 632 cows from 22 herds produced a daily average of 14.97 lb. of milk containing 4.47 per cent. of butter fat, which is equivalent to .669 lb. of butter fat. This is a good average when it is considered that 12 of the herds averaged below this figure.

The longer established units at Beaudesert and Maleny showed a decrease in the average daily yield owing to the approach of winter conditions.

At Beaudesert, 851 cows from 17 herds produced a daily average of 10.11 lb. of milk per cow. This milk contained an average of 4.83 per cent. of butter fat, equivalent to .488 lb. of butter fat per day. Seven of the herds tested below the unit average.

At Maleny, where two units are being conducted, 1420 cows were tested from 37 herds. The daily average milk yield for each cow was 11.46 lb. containing 5.27 per cent. of butter fat, equivalent to .604 lb. of butter fat per day. Only 12 out of the 37 herds were below the unit average.

Mechanical Sugar Cane Loaders.

Early in the current harvesting season, two new mechanical sugar cane loading units, built by Fowler Construction Co. of Melbourne, were sent to North Queensland for field trials. In an endeavour to overcome labour shortage during recent years a number of mechanical loaders of varying construction have been built within the industry but the new type is quite revolutionary in design. It is drawn behind a conventional tractor and all of its movements are controlled by the tractor-driver by means of an ingenious and simple system of hydraulically operated controls. The loader is capable of lifting 5 cwt. of cane at a time and is expected to handle 10 tons of cane per hour. The units, which are being closely observed by officers of the Bureau of Sugar Experiment Stations, are still being operated experimentally and much more information is required before evaluating their contribution to the problem of canecutter shortage. Great hopes are held out for their ultimate success, however, because reliable mechanical loaders would be one of the major present day advances in the mechanisation of the sugar industry.

New Green Manure Crops.

Considerable interest is being evinced by sugar growers throughout the State in some new green manure crops recently released by the Bureau of Sugar Experiment Stations. A cowpea known as Reeves Selection, Q.1582, has demonstrated marked resistance to bean fly attack and to "wilt" which were making the growing of the standard green manure types more precarious each year. In the wetter areas in particular the fungus causing "wilt" results usually in complete collapse of the common green manure varieties whereas Reeves Selection has grown to perfection under the worst of conditions.

In southern Queensland sugar cane areas some new types of velvet beans have attracted more than usual attention. The drought resistant qualities of these types make them admirably suited for the long rainless periods frequently experienced. Stocks of both these varieties are being propagated rapidly in seed growing areas to supply the ever increasing demand from canegrowers for more suitable legumes.

Rural Topics

Pasture for Silage.

Pasture growth which is being harvested for silage should be cut when the principal plant species is in flower. In the case of paspalum, early cutting while the ergots are in the "honey dew" stage avoids the danger of digestive troubles when feeding later. The pasture is usually cut with a mower, and a sweep rake is very useful for handling the cut grass.

The cutting of excess pasture growth for silage permits of an improvement in the sward by allowing surplus growth to be removed at the best time for the pasture. Silage should be made, whenever possible, from the better quality material offering at times which are unsuitable for hay making. Silage making is complementary to hay making, and there is considerable scope for an extension of this method of pasture management, viz., cutting of excess growth which cannot be eaten down by stock in order to allow more vigorous growth of the remaining sward.

A further advantage of silage making as opposed to hay making in the conservation of pasture products is the aspect that silage making permits of cutting earlier and under more uncertain weather conditions, thus allowing the pasture to make good growth and protect the plant roots and soil surface from the drying action of the sun later in the season, or the ill effects of hot winds and other adverse factors.

Farmyard Manure.

Farmyard manure is a valuable commodity that should not be allowed to go to waste.

A large part of the plant food in the herbage eaten by farm animals is voided in the dung and urine, and the return of this excreta to the soil is most necessary if the fertility of the soil is not to be exploited.

Pasture research officers of the Victorian Department of Agriculture point out that, as a fertilizer, farmyard manure contains, in addition to the several mineral elements necessary for plant growth, organic or vegetable matter that breaks down in the soil to form humus. This humus serves the dual purpose of maintaining the soil in a good physical condition, and providing food for the millions of micro-organisms essential for soil fertility.

Most farmers do not make any provision for collecting the urine that is allowed to run away from the milking shed, while the dung is frequently thrown on to a heap where it wastes away.

Probably the most satisfactory method of conserving the fertilising matter in farmyard manure is to allow the urine and washings from the milking shed to drain into a sunken tank, and to collect and deposit the dung from the yards into a pit from which the drainage will also run into the tank. The distribution of the liquid can be carried out with a liquid manure spreader in the form of a portable tank.

Of the two forms of excreta, the urine is the most valuable fertiliser, and from the point of view of preventing a potash deficiency in overworked pastures, it is the more importrant.

Superphosphate is, and probably always will be, the most important fertiliser in this State, but its outstanding value should not be permitted to obscure the value of those lesser known, but nevertheless important minerals, the return of which to the soil through the dung and urine is necessary for the maintenance of productive pastures.

Disarmament in the Cow Yard.

"We want disarmament in the cattle world. All dairy animals should be dehorned." Professor Petersen, America's leading authority on dairying, made this comment when on a recent visit to England. He added—"The dairy animal has no need for horns except aggressively. She has no need to protect herself any more and they are definitely a menace to any timid members of the herd." Dehorned animals have, Professor Petersen said, been accepted by breed societies in America for years. It was permissible to dehorn any breed but custom decreed that the Jersey and the Ayrshire stood a better chance in the show ring, when dehorned.

—*Australian Dairy Review.*

The Cow's Age—Effect on Milk.

That the age of a cow has some influence on the composition of milk is claimed by Mr. O. St. J. Kent, B.Sc., who points out that the most important change with advancing years is a slight decrease in the percentage of fat. The variation, although of no great consequence, is noticeable nevertheless. A cow which shows an average test of 5 per cent. fat as a young animal, will decline to about 4.5 per cent. if she continues to produce to 14 years of age.

It is sometimes thought that a heifer showing a low test as a two-year-old may improve as she matures. Experiment, however, has shown that there are no grounds for such belief, and any farmer building up hopes of this nature is likely to be disappointed. The richness of milk is a matter of inheritance and so far as is known, nothing can be done to change it in the individual animal.

The effect of age on the fat test of milk should not be confused with the effect of age on milk production. There is a gradual increase in the quantity of milk produced until a maximum period is reached, after which the production figures show a decline. The age of maximum milk production for most breeds is eight or nine years.

—*Australian Milk and Dairy Products.*

Herd Testing and the Cost of Production.

Dairy farmers can make more profits by lowering the cost of production, and as has been frequently pointed out in this paper the quickest way to reduce the cost of production is to increase the yield per unit. In two words BREED and FEED. The quickest way to decide what results are being obtained is to test all cows, and to assist in this the Department of Agriculture has made certain funds available to help these farmers who are anxious to help themselves.

How does testing the herd link up with BREED and FEED?

In the first place there's feeding and records obtained from testing will enable you to feed according to production and so get the most out of your feed, be it grain, hay, ensilage, or just grass.

Then there's culling and your testing records enable you to cull the low producer. Often a few boarder cows will reduce profits by eating feed and taking up space and time when they are not producing their share. The herd record books point out the good cow from the bad and the dairy farmer can cull out the bad.

Good dairymen know that using any bull is a gamble until he proves himself through production records of his daughters. Testing and record keeping gives this information and proves the bull in the shortest time possible.

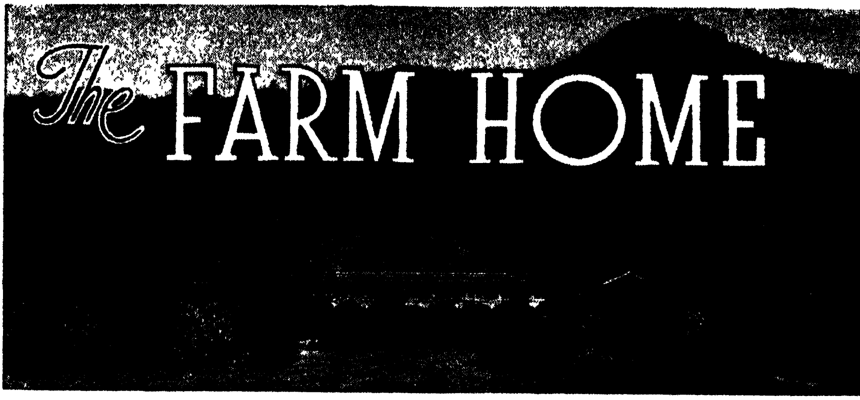
Testing and records point out the good breeding cows in your herd, and good breeders; those animals which transmit good production to their offspring are a big help in building up your herd replacements for future profits.

Any quick change in production, whether it is poor feeding, poor management or what, can be noticed immediately from your record book. And the quick correction of the fault can easily mean big increases in production, big reduction in costs per unit and big increases in profits for the owner.

And another record which pays dividends is the record of the breeding times. This tells you just when each cow should be dried off to enable her to secure the necessary rest before her next lactation period, and enable the guess work to be taken out of calving times.

To those farmers who supply milk for the liquid milk trade this is most important on account of the higher price which usually rules during the winter months.

—*The Unity Co-operator* (Toowoomba).



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

YOUR CHILD'S EYES ARE A PRECIOUS POSSESSION.

IT would be most unusual for anyone having an expensive camera which he knew could not possibly be replaced—not to take the greatest care of it. It is therefore quite illogical that people do not take the greatest care of two very precious cameras with which they are provided at birth—namely their eyes.

Parents should learn as much as possible about eyes and their care so that they can safeguard not only their own eyesight but that of their children. As a child reaches an age when he can appreciate the importance of such things he in his turn should be taught the vital necessity of taking care of his eyes.

The eyes are like a camera and have parts which work in the same way as those of a camera work. They have a lens to see near and far objects, a shutter or iris to cut down the light, a dark chamber like the camera box to keep out side light, and the retina which, like the film, makes photographs of the scenes we look at.

For the first 5 or 6 weeks after birth the muscles of a baby's eyes are quite unco-ordinated, but by the age of 3 or 4 months he can usually fix his eyes on objects straight in front and follow them well when they are moved.

The eyes of a normal child are straight. He does not frown or become tired when reading and he sits in an easy natural position. His eyes are bright and free from redness and he does not complain of headaches.

To Preserve the Eyesight.

In order to keep the eyes working normally, it is a good plan to have the eyes and vision of every child examined when he begins to read and at least once a year afterwards.

Unless carefully watched and cautioned, children often read in a poor light or by a badly adjusted light or for too long at a time.

Reading should only be allowed when there is a good steady light. The correct way is for the child to sit with his back to the light and with the light coming over the shoulder so that there are no shadows.

The book or paper should be held 11 to 14 inches from the eyes. The type should be large and distinct.

Children should not be permitted to read facing a light and if the table is highly polished some covering of dull faced dark-coloured material should be provided so that the light is not reflected into the child's eyes. Children's books should be printed on dull not glossy paper.

To prevent over-strain of the eyes during reading or studying, children should be taught to raise the eyes often and look out of the windows or into a distant corner of the room. This rests the muscles of the eyes.

Defective Eyesight Should be Recognised Early.

To do his best work a child needs normal vision and if his sight is defective it should be corrected by glasses.

Unfortunately, children may suffer from poor sight without the condition being recognised by parents or teachers and a child may be accused of being dull or clumsy when in reality he cannot see the writing on the blackboard or the objects over which he stumbles. Regular examination of the eyes will prevent this regrettable mistake.

Any further advice on this and other matters connected with children may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau,* 184 *St. Paul's Terrace, Brisbane,* or by addressing letters *"Baby Clinic, Brisbane."* These letters need not be stamped.

HANDY HOME HINTS.

Clothes Cleaning Hints.

To remove stains, the material should first be considered: its colour, weight, and composition, whether it be from animal or vegetable fibre, the substance making the stain, and the kind of substance which will remove that type of stain.

Cotton, linen, and artificial silk are of vegetable fibre origin; wool and real silk, animal fibre.

The materials used as stain removers may be classed as bleaches, solvents, absorbents, and neutralizers. Of these, the solvents are the ones in general use, such as alcohol, benzine, chloroform, or turpentine. These may be used on material which water will spot. Absorbents are used for grease. Bleaches should be used as a last resort and only in a mild solution. In using bleaches be sure you know the composition of them, for strong alkali will destroy animal fibres, and strong acids destroy vegetable fibres.

Common Stains and Their Treatment.

Blood and meat juices—cold water, soap and cold water, starch paste.

Blueing—boiling water.

Chocolate and cocoa—borax and cold water, bleach if necessary.

Coffee and tea—cold water, then hot water.

Cream and milk—cold water, then soap and tepid water.

Egg—cold water.

Fruit and fruit juices—boiling water, bleach if necessary.

Grass—cold water, soap and cold water, alcohol.

Grease and oils—blotting paper, warm water and soap, petrol or benzine.

Iodine—warm water and soap, alcohol, or ammonia.

Ink—try cold water, then bleach if needful.

Iron—paste of lemon juice and salt.

Kerosene—warm water and soap.

Lamp black and soot—kerosene, benzine, or gasoline.

Medicine—alcohol.

Mildew—if fresh, try cold water, javelle water, or soak in sour milk and put in the sun.

Paint and varnish—turpentine, chloroform, or alcohol.

Perspiration—soap and water, bleach with javelle water in sun.

Pitch, tar, or wheel grease—rub with lard, then wash with soap and water.

Scorch—bleach in sun or with javelle water.

Shoe polish, black—turpentine; tan—alcohol.

Stove polish—cold water and soap, gasoline.

Vaseline—kerosene or turpentine, or absorbents.

Wax—scrape off as much as possible; use absorbents or gasoline.

Special Cleaning.

A little special cleaning will help preserve a well groomed appearance and add months of wear to a garment.

To wash corduroy. Corduroy is a kind of cotton velvet and may be successfully washed provided it is not rubbed, squeezed, or ironed. Use a solution of mild soapsuds, souse the garment up and down in the soap suds, changing the suds when dirty, rinse in several waters until no more dirt or soap comes out. Hang up dripping wet in the shape in which it is to be worn, dry in the wind if possible; when dry, brush briskly to raise the nap.

To freshen velvet. When the nap is crushed, steam carefully by laying a wet cloth over the back of the velvet, lift the two together and pass over an inverted hot iron, or hold velvet stretched over the steam from a vessel of boiling water. Dust may be removed by brushing, then sponging carefully and then steaming.

Woollens and most silks may be washed if care is exercised. Use lukewarm water both for washing and rinsing, using a very mild soap solution. Never rub soap directly in silk or wool. Use a kneading motion in washing rather than rubbing. Oft-times a garment which has been carefully washed is ruined in the drying. The sun will shrink woollens, harden them, and turn white silk and wool yellow; it will fade colours, too. Dry wool in the shade or indoors; wrap white silk in a cloth and leave at least half an hour or longer and press with an iron not too hot.

To remove wrinkles, sponge with clear water and press. To remove shine, sponge with a solution of one tablespoonful of ammonia in one quart water, then with clear water; press and then brush to raise the nap.

Dry cleaning is cleaning without water but not necessarily without liquids. Gasoline and benzine are the most common of the dry cleaners. They are very inflammable, but can be used with safety if ordinary precautions are used. That is, use only out of doors away from a fire and never store in the house.

IN THE FARM KITCHEN.

A Dish for Supper.

One pound of onions, ½ lb. bacon rashers, 3 oz. cheese, ½ cup of milk. Put a layer of bacon in a piedish, cover with sliced onions, and fill the dish in this way. Sprinkle with pepper and salt; pour over the milk, cover the dish and bake. Then slice or grate the cheese over and put back into the oven until the cheese has melted. Any odd bits of bacon can be used, and it makes a nice dish for supper.

Mint Chutney.

This is a change from the ordinary chutney: ½ lb. ripe tomatoes, 1 lb. cooking apples, 6 small onions, ½ cup of mint leaves, ½ cup of currants or sultanas, 3 cups of vinegar, 2 cups of sugar, 2 teaspoons of dry mustard, and 2 oz. of salt. Boil the vinegar, add sugar and seasonings, let cool. When cool add the chopped ingredients and boil until the apples are tender and seal in jars. Allow to stand at least ten days before use. This chutney keeps its fresh flavour.

Chilly Day Chowder.

Half pint butter or haricot beans, ½ pint sliced tomatoes (bottled will do), salt and pepper to taste, 1 pint milk, ½ pint diced carrots, 1 tablespoon chopped onion, 1½ quarts cold water, 1 tablespoon minced parsley, 1 tablespoon flour, a little extra water. Rinse beans, then place in a basin. Cover with the water. Stand for 12 hours. Turn the water remaining into a pan. Bring to the boil, then add vegetables, except parsley. Cover and simmer till tender. Add salt and pepper to taste. Cream flour with a little water. Stir into chowder. Add milk. When boiling, cover and simmer for half an hour. Add parsley. Enough for five or six persons.

Three-in-One Pumpkin.

Pumpkin, small quantity of dripping, apples, bacon, minced meat, salt and pepper. Cut a pumpkin in half, remove the seeds, rub the inside with dripping, and steam half an hour. Take it out of the steamer and fill it with cold minced meat, a little bacon and gravy (or vegetable stock) to moisten. Top with raw apples, sliced thin. Cover with well-greased paper and bake three hours, serving it in the shell as it comes from the oven.

QUEENSLAND WEATHER IN MAY.

Heavy to flood rains commenced at the end of April in the South-eastern corner of the State and continued during the first three days of May. These opportune falls were the chief contribution to the over-average figures in the Port Curtis, Moreton, Darling Downs and Maranoa districts. Coastal areas benefited to the extent of five inches and many parts of the Downs and Maranoa averaged approximately two and a half inches, with normal one inch amounts in the Warrego. In all these districts the winter should commence with favourable prospects for agricultural, pastoral and dairying industries. The Central Coast, East, rains, during the same period, were under-average, but in many districts they came at a time to do most benefit. Only very isolated useful totals, however, were registered in the adjacent Central Highlands, East Carpentaria fringe, and parts of the central interior

Throughout the greater part of the main inland pastoral areas from the Gulf to the south-west many stations have received practically no rain since March In February, a considerable portion of the South-west and southern border areas were placed in a good wintering position by a three to six inch over average rain, but elsewhere with the absence of any inland monsoonal rain during the summer, there has been a steady general seasonal deterioration since the relief rains of September, 1947, and patchier follow up storms which practically ceased during the early part of December.

Floods.—Some very heavy local daily rain totals included 10 inches at Theebine and 1127 points at Miva (30th April). On the 1st May many 5 to 6 inch totals were recorded in coastal districts from the southern border to the Rockhampton area. Heavier amounts included 666 points at Petrie, 755 Goodwood, 740 Rosedale, 766 Lowmead and 1235 at Bustard Head The Mary River carried the highest flood waters because of the phenomenal local rains over its head waters, there was a considerable amount of flooding in low lying areas with traffic disruption.

Maximum Heights.—Mary River—Kenilworth, 29 ft. 6 in., Cooran, 20 ft ; Gympie, 49 ft. 2 in.; Miva, 42 ft 6 in., Tiaro, 44 ft., Maryborough, 19 ft. 3 in.

Temperature— Maximum temperatures were below normal over most of the State, up to 3.0 deg. at Mitchell and 4.7 deg. at Georgetown, but Palmerville 89.7 deg., was 1.8 deg. above

Minimum temperatures were slightly above normal in the Cairns, Georgetown, Palmerville, Longreach areas, but below normal in southern districts, Mitchell 3.0 deg and Thargomindah 4.0 deg

Frosts—Many frosts in the south-eastern quarter, especially the latter half of the month when they were practically continuous with some sharp low readings. Stanthorpe 17 nights (10 consecutive), 18 deg. screen and 10 deg grass, 31st (10 deg., equal to previous May record 1927). Mitchell 15 nights (13 consecutive) 25 deg and 16 deg 31st Kingaroy 14 nights (6 consecutive), 26 deg. and 21 deg 22nd

Brisbane— Mean pressure $\frac{9 + 3}{2}$ 30.038 in, normal 30.086 in —Temperature—Mean maximum 73.5 deg., normal 73.6 deg ; Highest daily 83.5 deg., 5th, Mean minimum 53.7 deg., normal 55.6 deg Lowest daily 43.0 deg., 22nd, Mean temperature 63.6 deg., normal 64.6 deg

Rainfall—190 points, 6 days, average 273 points 10 days

Rain position is summarised below :—

Division.	Normal Mean.	Mean May, 1948.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	137	364	166 above
Peninsula South	50	6	88 below
Lower Carpentaria	38	Nil	100 ,,
Upper Carpentaria	58	19	67 ,,
North Coast, Barron	300	125	58 ,,
North Coast, Herbert	434	182	58 ,,
Central Coast, East	165	82	50 ,,
Central Coast, West	81	23	72 ,,
Central Highlands	127	57	55 ,,
Central Lowlands	87	47	46 ,,
Upper Western	51	1	98 ,,
Lower Western	69	Nil	100 ,,
South Coast, Port Curtis	203	510	152 above
South Coast, Moreton	349	538	54 ,,
Darling Downs, East	156	246	58 ,,
Darling Downs, West	143	287	101 ,,
Maranoa	137	262	91 ,,
Warrego	112	97	13 below
Far South-West	97	19	80 below

Commonwealth of Australia, Meteorological Bureau, Brisbane

ASTRONOMICAL DATA FOR QUEENSLAND.

JULY.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.39	5.3	Cairns	9	49	Longreach	27	43
6	6.39	5.5	Charleville ..	25	29	Quilpie	37	33
11	6.39	5.7	Cloncurry . ..	37	63	Rockhampton ..	1	19
16	6.38	5.10	Cunnamulla ..	31	27	Roma	15	19
21	6.36	5.12	Dirranbandi ..	22	16	Townsville ..	8	41
26	6.34	5 15	Emerald	12	28	Winton	29	51
31	6.31	5.17	Hughenden ..	21	49	Warwick	5	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Day.	Rise.	Set.
	a.m.	p.m.
1	12.42	12.31
2	1.38	1.03
3	2.38	1.40
4	3.40	2.22
5	4.46	3.13
6	5.53	4.13
7	6.57	5.20
8	7.55	6.31
9	8.45	7.42
10	9.29	8.51
11	10.08	9.57
12	10.43	11.00
13	11.16	..
		a.m.
14	11.49	12.02
	p.m.	
15	12.24	1.03
16	1.02	2.04
17	1.44	3.05
18	2.31	4.06
19	3.22	5.03
20	4.16	5.57
21	5.12	6.45
22	6.09	7.27
23	7.04	8.04
24	7.57	8.37
25	8.50	9.07
26	9.42	9.35
27	10.34	10.03
28	11.28	10.31
29	..	11.01
	a.m.	
30	12.24	11.34
		p.m.
31	1.24	12.13

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	17	22	32	38	8	13	37	44
6	9	30	25	45	0	21	26	53
11	15	21	31	38	7	12	35	43
16	27	13	43	26	18	3	50	32
21	29	10	45	24	20	0	52	27
26	19	17	36	33	10	8	41	37
31	12	28	27	43	2	19	30	51

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS)

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	24	36	46	55	31	40	21	31
3	15	46	40	61	25	47	14	38
5	6	53	35	66	20	51	6	44
7	3	53	34	66	18	51	4	44
9	11	46	38	61	23	47	10	38
11	21	34	44	54	29	39	18	29
13	33	23	52	45	37	30	27	20
15	43	17	60	42	45	27	36	16
17	52	7	66	35	50	21	43	8
19	53	3	68	32	51	18	45	4
21	53	4	67	33	50	19	44	5
23	45	11	61	38	46	23	37	11
25	35	20	54	44	39	29	29	18
27	26	30	47	50	32	35	22	25
29	20	39	44	57	29	42	18	34
31	11	49	38	63	23	49	10	41

Phases of the Moon.—New Moon, 7th July, 7.09 a.m.; First Quarter, 13th July, 9.30 p.m.; Full Moon, 21st July, 12.31 p.m.; Last Quarter, 29th July, 4.11 p.m.

On 15th July, the Sun will rise and set respectively, about 23 degrees north of true east and true west, and on the 12th and 26th the Moon will rise and set at approximately true east and true west respectively.

On 4th July, the earth will be in Aphelion—the point in its orbit farthest from the Sun. There will then be 94,600,000 miles between the Sun and us.

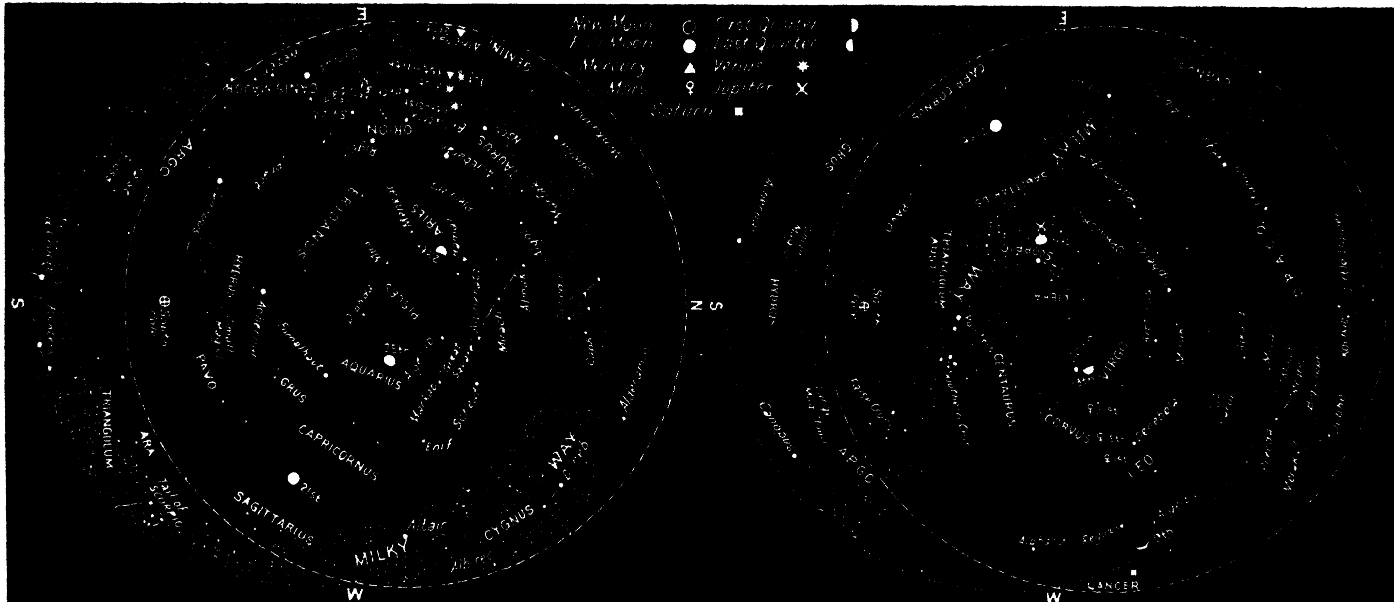
Mercury.—Will be a morning object all this month, rising about 50 minutes before the Sun on the 1st and reaching greatest elongation west on the 16th, when it will rise more than 1½ hours before sunrise. At the end of July it will rise about ¾ hour before the Sun.

Venus.—Now a morning object, and on the 1st will be 1 degree north of Mercury, but both planets are rather too close to the Sun for observation. On the 31st, in the constellation of Taurus, it will again reach greatest brilliancy and will rise about 2¾ hours before the Sun.

Mars.—In the constellation of Virgo, at the beginning of July, will set between 10.30 p.m. and 11.30 p.m., and by the end of the month will set between 9.45 p.m. and 11 p.m.

Jupiter.—Just to the east of Scorpio, now rising during the afternoon and is well up in the sky by nightfall. On the 1st Jupiter will set just after sunrise, and by the end of the month will set between 3.15 a.m. and 4.15 a.m.

Saturn.—Low in the west during evening twilight at the beginning of the month, but by the end of July may be too close to the Sun to be observable.



Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m along the Northern Territory border on the 15th July (for every degree of longitude we go west the time increases 4 minutes). The chart on the left is for 10 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and smilarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars wil be in the positions shown about 1 hour later than the time stated for the 15th, and at the end of the month about 1 hour earlier than that time. The positions of the Moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month

RAINFALL IN THE AGRICULTURAL DISTRICTS.

MAY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May	No. of years' records.	May 1947.	May 1948.
North Coast.	In.		In.	In.
Atherton	2 34	42	3·32	1·90
Cairns	4·51	61	5·23	1·69
Cardwell	3·64	71	4·35	1·13
Cooktown	2·76	67	6·51	0·54
Herberton	1·72	57	1·06	1·52
Ingham	3·76	51	7·52	0·88
Innisfail	12·30	62	16·12	3·08
Mossman	3·10	19	4·84	0·99
Townsville .. .	1·24	72	1·06	1·43
Central Coast.				
Ayr	1·09	56	1 02	1·21
Bowen	1·28	72	0·62	0·43
Charters Towers ..	0 78	61	0·81	0·45
Mackay	3·86	72	1·81	0·83
Proserpine	4·22	40	1·91	0·89
St. Lawrence ..	1·74	72	1·93	1·19
South Coast.				
Biggenden	1·80	44	0·61	4·10
Bundaberg	2·63	60	1 75	8·13
Brisbane Bureau ..	2 79	95	2·18	4·90
Caboolture	3 27	67	2·45	6·64
Childers	2 17	48	1·30	6·85
Crohamhurst.. ..	5 04	50	4·41	10·13
Esk	2 00	56	1 81	3·47
South Coast—cont.	In.		In.	In.
Gatton College ..	1·53	44	1·74	..
Gayndah	1·55	72	0·26	3·62
Gympie	2·91	73	1·64	4·80
Kilkivan	1·85	62	1·49	3·93
Maryborough ..	3·01	72	1·94	7·35
Nambour	5·09	47	3·72	7·86
Nanango	1·60	61	2·69	2·51
Rockhampton ..	3·03	72	1·34	4·15
Woodford	1·55	55	2·88	6·27
Central Highlands.				
Clermont	1 29	47	0·62	0·10
Springsure	1·23	74	1·41	0·44
Darling Downs.				
Dalby..	1·29	73	1·37	2·30
Emu Vale	1·12	47	1·15	1·54
Jimbour	1·21	64	0·90	0 95
Miles	1·51	58	1·64	1 80
Stanthorpe	1·75	70	0·99	2 23
Toowoomba	2·14	71	2·43	3·48
Warwick	1·48	78	1·80	2·17
Maranoa.				
Roma	1·42	69	1·38	2·51
St. George	1·41	62	1·25	2·56

CLIMATOLOGICAL DATA FOR MAY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	82	68	87	3	62	21	169	10
Herberton	..	73	55	82	3	44	17	152	9
Townsville	..	82	63	87	2	51	21	143	1
Rockhampton	30·08	78	52	87	5	41	28	415	5
Brisbane	30·00	73	53	83	5	43	22	490	6
Darling Downs									
Dalby	..	71	42	81	5	20	31	230	4
Stanthorpe	..	65	35	79	14	18	31	223	6
Toowoomba	..	67	42	77	5	30	21	419	7
Mid-Interior.									
Georgetown	29·97	81	60	93	7	48	28	Nil	Nil
Longreach	30·11	80	53	92	19	44	28	87	2
Mitchell	30·15	70	41	83	5	30	22	118	3
Western.									
Burketown	..	89	62	95	5	51	22, 25	Nil	Nil
Boulia	30·06	79	53	89	4	33	28	Nil	Nil
Thargomindah	30·14	70	46	83	4, 18	37	21, 28	9	2

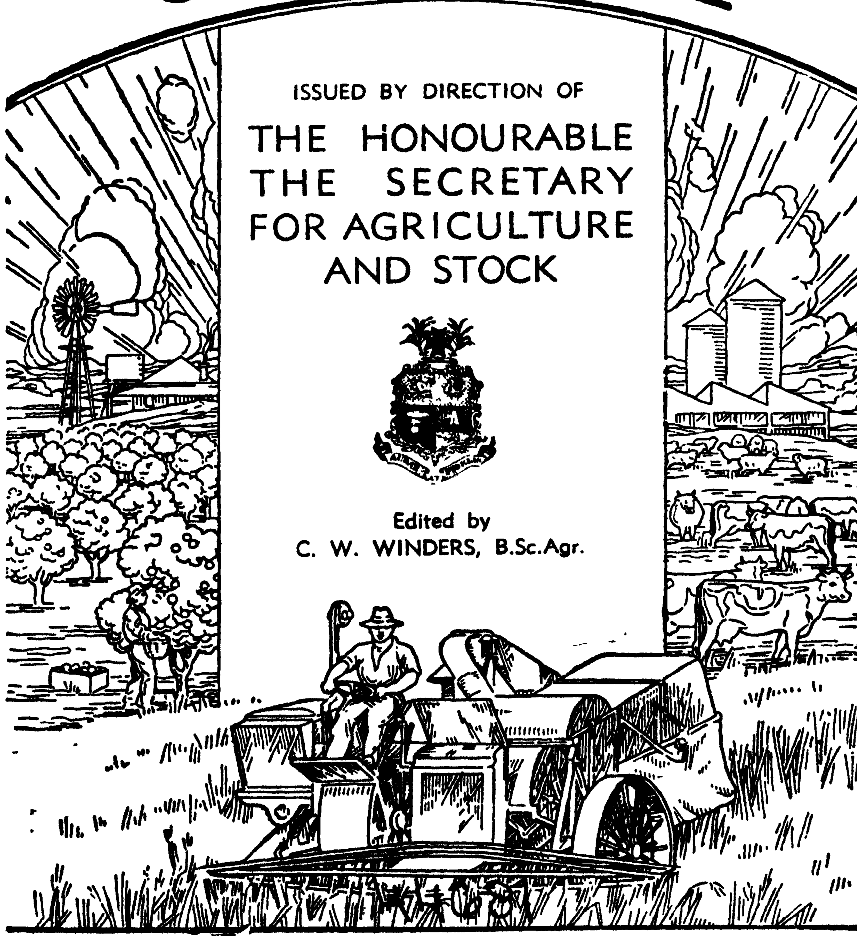
A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

Supplement to the "Queensland Agricultural Journal," March, 1949.

Volume 67

QUEENSLAND AGRICULTURAL JOURNAL



ISSUED BY DIRECTION OF

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Edited by

C. W. WINDERS, B.Sc.Agr.

JULY TO DECEMBER, 1948

Vol. 67 Parts 1 to 6

QUEENSLAND AGRICULTURAL JOURNAL

GENERAL INDEX.

INDEX TO ILLUSTRATIONS.

AUTHOR INDEX.

A. H. TUCKER, Government Printer, Brisbane.

Volume 67

Part 1

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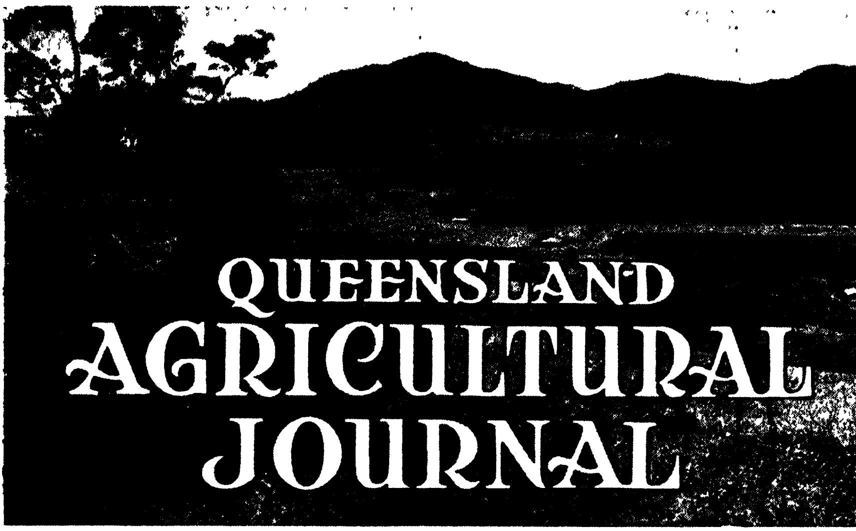
Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Art, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**



Volume 67 | 1 JULY, 1948 | Part 1

Event and Comment.

Retirement of R. E. Soutter.

A NOTEWORTHY event during June was the retirement, under the retiring age regulations, of Mr. R. E. Soutter, after fifty years of service in the Department of Agriculture and Stock, a period of service during which, after the early years of tedious endeavour, achievement followed achievement. The impressive tributes paid to his plant-breeding work by the Minister for Agriculture and Stock (Hon. H. H. Collins), the Under Secretary (Mr. A. F. Bell), grain producers' organisations, and flour millers testify to its worth, which is reflected in the conspicuous part played by Soutter-bred wheats in the Queensland wheat-growing, flour-milling, and baking industries.

Mr. Soutter joined the Government service in 1898, his first appointment being as a horticulturist at the State Farm at Westbrook, near Toowoomba. He was subsequently placed in charge of wheat demonstration plots in the Maranoa, and in 1906 was appointed manager of the Roma State Farm, situated at Bungeworgorai. His main assignments were to demonstrate the new methods of dry farming in the Maranoa and to improve the rust resistance of the wheats then commonly grown.

At first the wheat improvement work was subsidiary to the elaboration of suitable farming methods for the district, but as the crossing and selection work began to show results more and more time was devoted to wheat breeding. The first of the Soutter-bred wheats to come

into commercial production at the expense of the older varieties was Flora. As an illustration of the time and patience required in establishing a new commercial variety, it might be mentioned that the original cross which gave the variety Flora was made between Bobs and Florence in 1911. It was eventually selected as a variety in 1919 and named in 1923. In the 1928-29 season Flora contributed only 20 acres to the State's wheat planting; by 1939-40 it was grown on over 55,000 acres.

With a large number of commercial varieties to his credit, Mr. Soutter was transferred to Brisbane in 1935 so that he could extend his breeding and testing work in the main wheatgrowing areas. In recent years wheats bred by him have comprised eight of the first ten varieties in order of importance, and have yielded two-thirds of the Queensland wheat crop. The popularity of the Queensland-bred varieties lies in their relative resistance to rust infestation combined with high yielding capacity and excellent milling quality.

The wheats produced by Mr. Soutter are a monument to his genius as a plant breeder. The affection felt for him by all who have been associated with him is a tribute to his sterling personal characteristics.

Services to the Woolgrower.

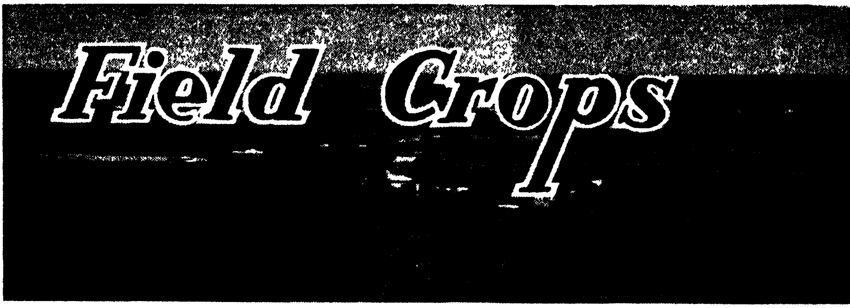
The Minister for Agriculture and Stock (Hon. H. H. Collins) has expressed pleasure at the way in which sheep raisers had responded to the efforts of the field officers of the Sheep and Wool Branch within the Department's Division of Animal Industry. He revealed that several branches of the Graziers' Association have written appreciative letters to the Department praising the service these officers were giving the industry.

Mr. Collins pointed out that during the last financial year 235 demonstration days had been held on sheep properties by the Advisers in Sheep and Wool. Most aspects of preventable economic loss had been covered, and property owners usually arranged for their neighbours to be present when demonstrations were in progress so that they could acquaint themselves with the most modern methods being used to overcome some of the problems facing woolgrowers.

In addition, said Mr. Collins, eleven large-scale field days were conducted, which were attended by more than 700 sheep men. The field days aimed at covering wider aspects of animal production, and this was an important phase in the development of the industry.

As part of its policy of providing an adequately trained staff of field advisers to assist woolgrowers throughout the State, the Agriculture Department has arranged for one of its junior officers to spend a year at Clonagh sheep station, in the Cloncurry district, to gain first-hand practical experience in sheep property management.

The Minister has announced that the officer chosen is Mr. W. J. Fielding, an ex-serviceman with a stock diploma from Gatton College, who has been gaining experience in wool classing and handling in the Department's Farmers' Wool Scheme. The special field training has been arranged through the courtesy of the Scottish-Australian Company, and Mr. W. Armstrong, manager of Clonagh.



Land Utilisation and Conservation.

A. F. SKINNER, Soil Conservationist.*

PROBLEMS of land utilisation and conservation are receiving at the present time more thought and attention by the nations of the world than ever before. The reason for this probably lies in the fact that under present systems of use the land resources of the world are not only inadequate to feed and clothe the present population but, if taken overall, are actually declining in productivity as a result of misuse and erosion.

History has taught two lessons: Firstly, nature's land resources cannot be ruthlessly exploited without being destroyed; secondly, nations that destroy their soil destroy themselves. Indeed, it has been said that the story of civilisation is the story of man's conquest, exploitation, and devastation of land.

Death of the land denotes the extreme and final stage in a definite sequence of events which commence with the removal of nature's protective mantle of vegetation from the surface of the soil. The effects of erosion are cumulative, and therefore the rate at which the process occurs progressively accelerates as the condition of the land deteriorates.

Importance of the Topsoil.

All forms of plant life, whether cultivated crops, pasture grasses, or forest trees, serve to break the direct impact of raindrops on the soil, while plant roots anchor the soil firmly in place. Dead plant litter on the ground further protects the surface of the soil and serves to hold the water temporarily in millions of tiny dams, allowing it to soak down into the spongy mass. Portion of this water later reappears at lower levels as springs, which feed the streams and keep them flowing throughout the year.

If precautions are not taken when the land is stripped of its vegetative cover much of the water that would have soaked into the soil will run to waste, carrying with it a load of the most valuable part of the soil, the topsoil. It is in this topsoil, each inch of which has probably taken from 500 to 1,000 years to build, that most of the food material for plants is stored. Most of the humus and plant food in any soil is usually within the top 6 or 8 inches. Soil rich in humus is a good home for the teeming millions of tiny micro-organisms, for earthworms,

* In an Australian Broadcasting Commission "Country Hour" talk.

and for other forms of life, all of which are important in making soil sweet and fertile. The hard and non-fertile subsoil has little nutrient to offer plants, and farming on eroded land is usually difficult and costly, with profits diminishing and ultimately disappearing altogether.

As the erosion process continues, the fertility of the soil declines and its power to absorb water also decreases. The percentage of water that runs off becomes progressively higher, with a corresponding increase in the amount of soil also lost. This increased amount of run-off water tends to add to the size of floods in the valleys and to cause damage in many ways. The soil washed from the hills is usually deposited in the beds of the streams, and in time may choke them completely or may gradually fill large reservoirs with useless silt. This is now a very serious problem in many parts of the world.

Because much of the water runs off the land instead of soaking in to feed the springs, streams will often cease to flow. Drought conditions appear to recur more frequently and to be more severe for the same reason. As each stage or condition develops the land becomes more and more susceptible to erosion, and thus the rate of damage accelerates.

During the early stages changes occur so gradually that erosion is seldom suspected as the cause, the usual conclusion being that the seasons have changed or that the soil is worn out.

Proper Use of Land.

The fundamental principle on which modern conservation practices are based is embodied in the creed of the American Soil Conservation Service, which is—"Use every acre for the purpose for which it is best suited and treat it according to its needs."

Land use capability—or, in other words, its suitability for a certain type of use—is governed by such factors as topographical relief and soil type, while the treatment needed for its protection will depend upon its condition and its susceptibility to run-off and erosion.

For example, land of very slight gradient can usually be cultivated with safety without the need for special protective measures. Slightly steeper land, whilst, perhaps, still suitable for cultivation, may require the use of some special protective measures, such as wider crop and pasture rotations, stubble mulching, or a system of contour tillage. Other land, such as on foothill slopes, may call for the use of still more intensive conservation practices, such as graded banks, grassed waterways, and so on, or may be suitable for use only as pasture land.

Extremely steep slopes, stony land, or land that is for any reason particularly vulnerable to erosion can often be used to best advantage if managed as a farm forestry area.

Control of Run-off.

The planning of land use also calls for special attention to the disposal of surplus run-off water. Care should be taken to preserve and protect the natural drainage system. Very often the main depressions, or storm watercourses, are ignored when land is being broken up and they are either ploughed up, used as laneways, or exposed to concentrated grazing. Under such conditions they are likely to erode severely and lead to the formation of gullies.

Every effort should be made to reduce the amount of water lost from the land as run-off to an absolute minimum. On cultivated land this can be achieved by the use of sound cultural practices, stubble mulching, and contour tillage; on grazing and forest land, by careful management of pastures, the control of fires and the construction of farm tanks and dams at strategic points along drainage lines.

As far as possible the general design of the farm layout should conform to the contours of the landscape. By this it is meant that fence lines and roads should follow, as closely as possible, a level line, or contour, or should cross the contours at right angles. In this connection it is mentioned that the orthodox square system of farm layout fits the topography of the landscape only when the land is level, but that is not often the case.

Loss of soil is, however, not the only factor of importance. The importance of actual loss of water which escapes from the land as run-off is very often overlooked, and to suggest that a person is farming on a 30-inch rainfall, for example, merely because his property is located in a 30-inch rainfall area, would be far from actual fact in most cases.

This point was very well illustrated by the Soil Conservator of South Australia (Mr. R. Herriott) in a recent broadcast talk, and his summary of the position as it applies in that State may be quoted. "The unnecessary loss of 45 points of rain water from a 100-acre fallowed paddock means that you have lost not only a million gallons of water but also 29 tons of soil, 100 bushels of wheat, the equivalent of 3 cwt. of superphosphate, the equivalent of 1½ cwt. of sulphate of ammonia, and 1/2,000 of your total topsoil. All this happened when there was no need for it."

Education in Conservation.

Moves are now being made in all States of Australia to ensure the better use of our soil, forest, and water resources and to encourage the extensive use of soil conserving agricultural and pastoral practices. In Queensland a number of Government departments have separately and co-operatively conducted various initial investigations and educational phases of the work.

With profits to the farmer at one end and savings to the State at the other, soil conservation is not only economically sound but is the only permanent basis on which the future security and prosperity of this or any other country can be guaranteed.

Progressive Farmers of the Gympie District.

[During a recent visit to the Gympie district, the Minister for Agriculture and Stock (Hon. H. H. Collins) was shown over some of the progressive farms, and expressed his pleasure at the advanced methods of agriculture and dairying adopted. The following notes on some of the properties visited have been supplied by the Minister for publication.—Ed.]

Fruit Production.

LAST summer's crop of pineapples in the Gympie–Mary Valley area amounted to 250,000 cases, and it is estimated that the total yield for the summer, intermediate and winter crops will be in the vicinity of 400,000 cases. Bananas and papaws are other important fruit crops in the district.

On the "Red Slopes" property at Goomboorian, farmed by Messrs. W. N. and A. E. Buchanan, a range of horticultural crops is being grown and irrigation is being judiciously used to stabilise production. Water is pumped mainly from Tinana Creek and is held in two large concrete tanks in an elevated position, from which it gravitates to spray lines or to irrigation channels. Pumping is also carried out from wells as required. Irrigation has been practised on this farm since 1942 and is applied to papaws, beans, and other crops.

The total area under crop on "Red Slopes" is 40 acres, including 12 acres each of pineapples and papaws and 10 acres of beans. The average per acre production of beans is over 100 cases. Last year the 12 acres of pineapples yielded 1,300 cases and a similar area of papaws produced over 6,000 cases, much of which went to the Sydney market.

Plate 1.

VIEW OF WEIR, UNDERSHOT WATER WHEEL AND CENTRIFUGAL PUMP SERVING MR. J. A. REIBEL'S FARM AT SEXTON.

Pleasing features of this farm were the scientific methods of production, the organised method of working and the planned marketing of the crops.

An inspection was also made of a large pineapple plantation at Amamoor, a 100-acre planting belonging to Messrs. Sanders Bros. Here large-scale cultivation methods were examined and the packing shed set-up inspected.

At Gympie, fruit ripening and vegetable cooling rooms, some operating, others under construction, provided pleasing evidence of advanced methods of catering for the consumer of farm products.

Progressive Dairymen.

On his farm at Sexton, 16 miles north of Gympie, Mr. J. A. Reibel has devised an irrigation system which he finds invaluable in the production of lucerne from his 40 acres of cultivation.

The irrigation plant consists of an undershot water wheel, which drives a centrifugal pump that lifts the water about 50 feet and gives sufficient pressure to operate a 37-nozzle spray line up to half-a-mile away. Water is diverted to the undershot wheel by a low rock weir on the river. The wheel itself consists of 13 tons of steel rotated on an 8-inch steel axle (see Plate 1). Apart from an occasional lubrication, the pumping plant runs virtually unattended. Though it is not protected against flood damage, the pumping outfit has suffered only slightly in the 17 floods that have been over it.

Lucerne grown on the farm is stored in a high barn into which the 2-ton hay truck can be driven directly.

Great interest was taken in the dairy farm of Mr. Arthur Walker at the Dawn. This farm has long been a model dairy farm, with paddocks well subdivided and laid out for most efficient grazing. A cultivation area of 70 acres provides most of the off-season feed requirements of the dairy cattle and pigs. The main crops grown are oats and grain sorghum.

Retirement of Mr. J. F. F. Reid.

MR. J. F. F. REID retired from the Department of Agriculture and Stock on 30th June, after twenty-seven years' continuous service as Editor of Publications.

Plate 2.
MR. J. F. F. REID.

Mr. Reid was born in Sydney and started his working life in a barrister's chambers. He left law for the land, and after completing the Sheep and Wool course at Sydney Technical College went into the pastoral industry in western Queensland, where he remained for some years. When agricultural lands in the South Burnett were opened for closer settlement, he was among the first selectors and acquired both scrub and forest country. As the district developed he became actively associated with the country Press, and as a newspaper editor gained a high reputation for his vigorous advocacy of rural interests.

On the outbreak of the 1914-1918 war Mr. Reid enlisted for active service with the A.I.F., in which he gained commissioned rank. At the end of the war he was appointed to H.Q., London, as a conducting officer with parties of A.I.F. farmers and graziers on educational tours throughout the United Kingdom and Ireland. He also travelled extensively in Europe. His experiences on all these tours were subsequently published as "Stud Stock Studies" (London, 1919) and "Rural Life in Other Lands." In the 1939-1945 war he served as a Staff Captain with the Volunteer Defence Corps.

Mr. Reid took an active part in the organisation of the Queensland Producers' Association. When radio was developed to the public utility stage, he organised a system of regular agricultural talks in association with the management of Station 4QG. He was chosen to speak for Queensland in the first Empire Broadcast. For many years he conducted the A.B.C. *Countryman's Session* and, more recently, *The Country News Magazine*. During the war he conducted the radio publicity section of the food production campaign in liaison with Commonwealth Food Control. .

Mr. Reid has been a special lecturer on journalism at the University of Queensland, was a foundation member of the Queensland Authors' and Artists' Association, and is a member of the John Oxley Library Committee and of Brisbane Legacy. Interested in local Government, Mr. Reid was a councillor of the Balmoral Shire until its absorption in the Greater Brisbane Area.

In his younger days Mr. Reid represented his district in Rugby Union football. As a member of the Royal Queensland Yacht Club he has sailed with a representative Queensland crew for the Australian yachting title on the waters of every State in the Commonwealth.

At a farewell function the Minister for Agriculture and Stock (Mr. H. H. Collins) spoke in eulogistic terms of Mr. Reid's sterling contributions to the education of Queensland farmers, and was supported by the Department's Under Secretary (Mr. A. F. Bell), who mentioned that Mr. Reid had kept the Department's monthly journal and its various advisory pamphlets in line with modern educational methods.

CATTLE HUSBANDRY

The Beef Cattle Industry in the Far West.

J. C. J. MAUNDER, Chief Inspector of Stock.

THE methods of raising beef cattle in the channel and off-channel country of the Georgina (Eyre Creek) and Diamantina rivers in western Queensland were the subject of an investigation by the author and Mr. S. C. Smith (District Inspector of Stock, Longreach) in July, 1947.

The prevailing pastoral conditions were dry, no floods having occurred in either river during the season and less than 3 inches of local rain having fallen over the area during the previous six months.

The route covered, travelling by car, was from Winton to Boulia, down the Georgina to a point just north of Birdsville and down the Diamantina to Durrie; west of Bedourie to Sandringham, and traversing typical "off-channel" country between the two rivers. This represented coverage of an approximate area of 50,000 square miles.

THE CHANNEL COUNTRY.

Channel Formation.

The outstanding feature of the area is the natural system of reticulated irrigation that is provided by the channels or de-tributaries that break off from the main channels of the rivers. These channels become shallower as they get further from the main channel and continue to branch and form additional off-channels. Some disperse fully while others may eventually rejoin the main channel.

The extent of flood water dispersal depends upon the height of the flood in the main river. A small flood in the river will result in a dispersal of water into the minor channels, while increasing height of the flood will result in further dispersal of waters into the "swamps" and finally over the flood plains. Flood waters recede from the flood plains after a period of inundation which may vary from a few days up to a couple of weeks. The water recedes from the channels more slowly and in the "swampy" areas may not disappear for a month or more.

A channel may disperse over a wide area of low-lying "swampy" country that, when flooded, will form an inland "lake." Such a lake would be "ponded" by low sand hills, and may be as large as 100 square miles in extent; Lake Machattie on the Georgina watershed is an example of this formation.

Soils of the Channels.

The soils of the channels and "swampy" areas are of heavy grey clay and contract greatly during dry periods between floods, forming very extensive cracks. These soils are very fertile and there is comparatively little leaching of plant nutrients to depths beyond the reach of plant roots. The surfaces are extremely rough and almost impossible to negotiate by motor vehicle.

Vegetation of the Channels.

Typical of the channels and swampy areas is the domination by blue bush (*Chenopodium auricomum*) and lignum (*Muehlenbeckia cunninghamii*). The limits of blue bush almost coincide with the flood water distribution of "channel floods" and demarcates that area of so-called "swampy country" in which the only feed produced is in response to flooding. Local rains produce no feed in the channels (see Plate 3). The lignum stands are in those parts of the channels in which the water may lie on the ground for a considerable time (Plate 4).

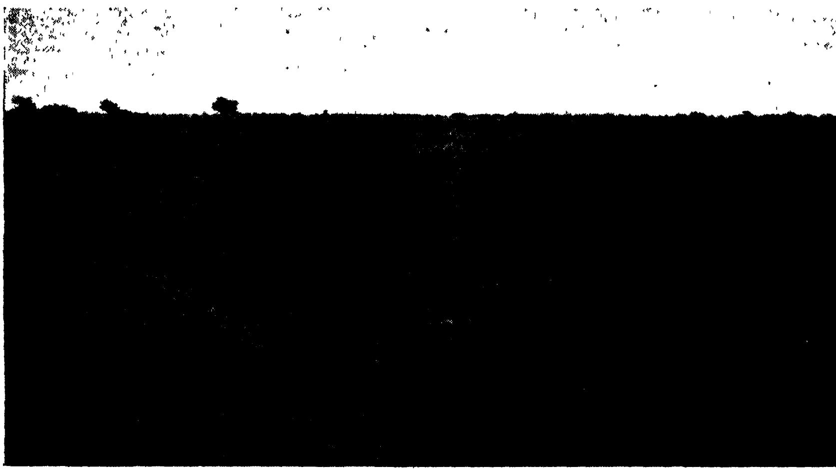


Plate 3.

BARE BLUE BUSH IN AN OFF-CHANNEL OF THE DIAMANTINA.—Note the complete absence of vegetation in the intervening spaces, and the large surface cracks of the heavy grey clay. Local rains will not produce feed in these channels; flood water only will do that.

Plate 4.

TYPICAL LIGNUM SWAMP FED BY CHANNELS OF THE GEORGINA.—The tall dark lignum bushes stand out plainly. The intervening spaces are dominated by dry native sorghum and cane grass. The marked shallow depression carries the very valuable "clover" feed, which appears as the water gradually recedes from the shallow channels.

Blue bush has some feed value but lignum is inferior as a stock feed. The valuable fattening feed of the channels consist of the so-called native sorghum (*Echinochloa turneriana*), neverfail (*Eragrostis setifolia*), pepper grass (*Panicum whitei*), channel blue grass, some Flinders grass (*Iseilema membranacea*) and a variety of good herbage. In the Georgina channels, "clover" (*Trigonella suavissima*) and native sorghum are the dominant channel feeds, but no clover whatever grows in the Diamantina channels. A coarse cane grass (*Eragrostis australasica*) of the channels grows with the lignum-sorghum communities, but it is of little feed value (Plate 4).

The native sorghum (actually it is not a true sorghum and does not form prussic acid) is the outstanding grass of the channel country and is a summer-growing annual. It comes away quickly after flood waters recede and grows vigorously to well above saddle height. It is of greatest value in the green stages, cattle showing decreasing liking for this grass as it dries off. Extensive flats, commonly 2–3 miles across, in good flood seasons are a vast sorghum field (Plate 5). In the earlier days, sorghum hay was made and stacked for hand-feeding to stud cattle, and there is no doubt it would make a very useful hay. The sorghum matures in a few months and seeds very heavily, the seeds finding shelter in the deep cracks that begin to open in the grey clay as the season dries out.

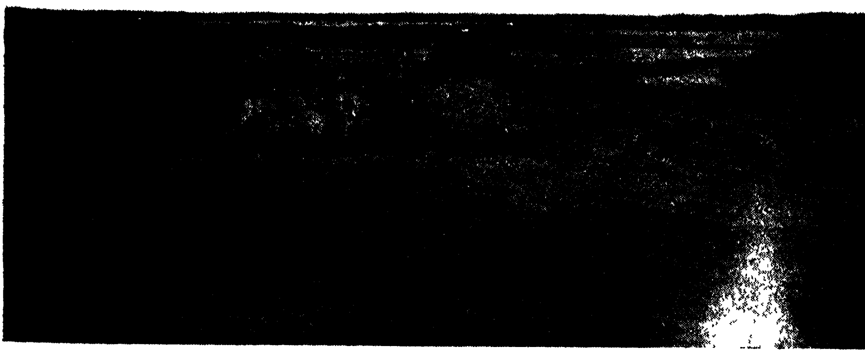


Plate 5.

VIEW FROM THE TOP OF A SANDHILL, LOOKING ACROSS A NATIVE SORGHUM FLAT WHICH EXTENDS TO THE DISTANT SANDHILL IN THE BACKGROUND.—Note the timber fringed waterhole and the channels branching out as indicated by the lighter timber lines. These channels are flooded from the Diamantina, the main channel of which would be approximately six miles from this point. At the foot of this sandhill were found the old winches which were used in the 1890s for constructing sorghum stacks.

With summer floods, the feed response is more marked with sorghum and the other grasses, whereas in later floods, March or April, the herbage response is much greater and more extensive than with summer floods. This is particularly the case with the clover of the Georgina.

The dominating timbers are coolibah (*Eucalyptus coolabah*) and gidgea (*Acacia cambagei*), which occur mainly as thin fringing belts along the channels.

THE FLOOD PLAINS.

Merging with and beyond the limits of the heavier "swampy" channel country which carries the lignum, blue bush, sorghum and clover, extend the level flood plains over which the flood waters disperse from the channels. Normally these plains are only submerged for a few days, which is sufficient time to soak the ground thoroughly, and flooding is followed by a good feed response. These flood plains vary from a mile or two up to several miles across, and the limits are in most cases marked by sandhills or low sand ridges (Plate 6).

Plate 6.

THESE CATTLE ARE WALKING BACK FROM WATER AND ARE ON THE FRINGE OF CHANNEL AND FLOOD PLAINS.—Note the tussocks of dried-out blue bush, denoting the fringe of the heavier channel soil as it merges with the lighter plain. The spaces between the tussocks are carrying a light covering of Flinders and button grasses.

Soil of the Flood Plains.

The soil generally is a reddish-grey loam, sometimes lightly covered with gravel and pebbles. Fine silt deposits occur from the periodical floodings. In the upper reaches of the Georgina and the Diamantina, these flood plains are not very extensive and quickly give way to the gravelly and pebbly downs and stony ridges. In lower reaches they are much more extensive, and as they get further from the main river channels gradually merge into the non-flooded gravelly downs and sandhill country.

Vegetation of the Flood Plains.

Unlike that of the heavier channel and "swampy" country, the vegetation of the flood plains will respond well to local rains in addition to flood response.

Button grass (*Dactyloctenium radulans*) and Flinders grass are the dominant species and constitute very valuable fattening feeds. Neverfail is also an important grass of the flood plain.

A wide variety of herbage comes away with winter rains, forming excellent feed.

There is no clover or native sorghum on these plains, nor is there any timber.

GRAVELLY DOWNS.

Beyond the limits of the flooded country extend the gravelly and pebbly downs areas that constitute the bulk of the country between the two rivers. The extent of these non-flooded downs would exceed the combined areas of channel country and flood plains. Between the upper reaches of the two rivers the gravelly and pebbly downs are more extensive than in the lower reaches, where they are inter-mingled with sandhill formations.

Plate 7.

TYPICAL STONY EXTREME OF GRAVELLY DOWNS WEST OF THE GEORGINA.—Stretches of this extremely stony downs formation may be very extensive, extending to the horizon of low stony hills. Large areas are quite devoid of plant growth, which is confined to the small bare patches between the stones and to the small gullies, depressions, and well-worn cattle pads.

Soils of the Gravelly Downs.

The soils of the gravelly downs consist of yellowish-brown to light-red clay with which is invariably associated a covering of gravel or pebbles. These may vary from a coarse gravel to large pebbles up to boulders as big as a man's head. Generally speaking, these downs are more stony between the Georgina and Mulligan Rivers (Plate 7) than between the Georgina and Diamantina, where the smaller pebbles and finer gravelly downs predominate.

Bare claypans do occur, though not frequently, nor as a rule are they extensive. One claypan traversed, however, was approximately 15 miles by 6 miles. The soils of these claypans are usually silty in nature, almost impervious to water and present a smooth, almost polished surface.

Vegetation of the Gravelly Downs.

The most important vegetation is undoubtedly Flinders grass and button grass, which, even in the dry state, where it forms a mere powdery, lick-up feed, will still fatten cattle. On some parts of the gravelly downs, between the upper reaches of the Georgina and Diamantina, there are relics of Mitchell grass tussocks, which indicate some deterioration of the country. It would appear that, up to 20 years ago, Mitchell grass was the most important feed in this country; in fact, on some properties old and discarded hay-making equipment remains as evidence of past practices of mowing the Mitchell grass and stacking as hay.

There is a light cover of neverfail, and with winter rains a profuse growth of edible herbage is stimulated. The gravelly downs are practically devoid of timber.

The area between the Georgina and Diamantina immediately south-east of Boulia comprises approximately 6,000 square miles of gravelly downs country, with practically no channel or flooded country. In past years this area turned off splendid fats but now has a much reduced stocking rate, due to a large extent to the disappearance of Mitchell grass from the pastures.

SANDHILL COUNTRY.

The intensely interesting sandhill country forming the eastern fringe of the Simpson Desert is an outstanding feature of the lower reaches of the Georgina and Diamantina and the country between these rivers in that area. From Mooraberrie to Monkira, to Cluny and Bedourie, one traverses the heart of this sandhill country. A few miles west of Bedourie the sandhills gradually give way to the harder, pebbly downs and stony ridges.

Sandhill Structure.

The sandhills vary in height from low sand ridges, with very little loose sand at their summit, to imposing sandhills up to 100 ft. in height, composed of loose sand that is constantly blowing in eddies and drifts, and the summits of which are entirely bare of vegetation (Plate 8).

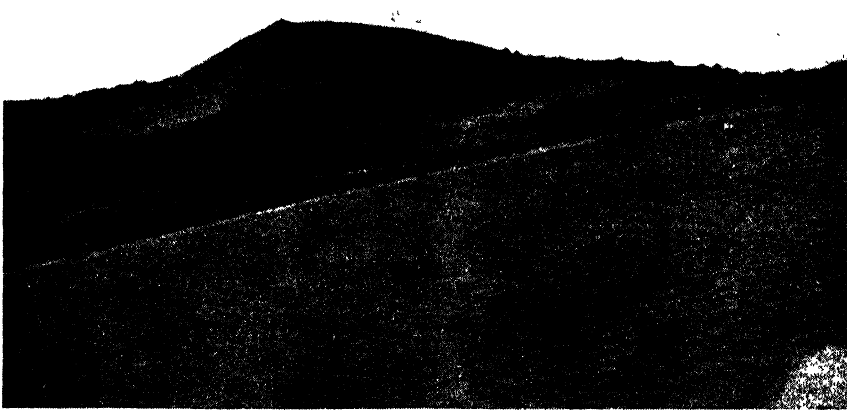


Plate 8.

LARGE SANDHILL IN THE HEART OF THE SANDHILL COUNTRY BETWEEN MONKIRA AND CLUNY.—From the bare summits, sand constantly blows in eddies and drifts. In many cases the sand blows, but is not removed from the formation, simply eddying around and finally lodging on the sides or in the depressions of the sandhill.

The sandhill formations generally have a direction from south to north and one "range" may run for several miles without a break. The distance between one "range" or line of sandhills and the next varies from ½-mile up to several miles.

In the heart of the best sandhill country, the area really comprises a series of flooded flats ½ to 1 mile in extent, divided from each other by lines of sandhills. These flats may flood from creeks which meander through the sandhill country, fed by local rains, and may also flood from typical channels which are the final de-tributaries from the main river channel.

As the sandhill ranges extend beyond the limit of channel floods they are separated from each other by wider stretches of downs country several miles in extent. Here, within a few hundred yards of the base, there is a light cover of sand drift, blown from the summits.

Vegetation of the Sandhill Country.

The lower sandhill ridges are covered right up to the summit with vegetation, consisting mainly of spinifex clumps and canegrass.

The higher sandhills carry an interesting gradation of vegetation. A flood plain may extend right to the foot of the slopes, carrying the usual cover of Flinders and button grass. On the slopes themselves, scattered, stunted trees of mulga and gidgea are to be seen. There is a considerable growth of herbage, including tahvine and a plant which resembles a giant pigweed. Generally speaking, the herbage is of less value as a stock feed than that which is to be found on the gravelly downs and flood plains. Spinifex (*Triodia basedowii*) and canegrass (*Spinifex paradoxus*) dominate the vegetative cover as the summit is approached. There is no doubt that stock can be maintained on the slopes of these sandhills in drought times, when all feed is exhausted on the flood and plain country.

Beyond the limits of the flooded country, there is sometimes a considerable cover of timber and excellent feed right to the base of the sandhills. The timber is generally a mixture of somewhat stunted mulga (*Acacia aneura*) and gidgea, while whitewood (*Atalaya hemiglauca*) and bauhinia (*Bauhinia carronii*) are fairly common.

The only stand of Mitchell grass seen in the whole of the Georgina-Diamantina country was in a stretch of country along the fringe of some sandhill slopes between Monkira and Cluny. This was on non-flooded country and was mixed with an excellent growth of Flinders and button grasses. Subsequently, it was ascertained that this particular area (Plate 9) had not been stocked for nearly 18 months.

Waterholes in the Sandhill Country.

Not the least remarkable aspect of this sandhill country is the prevalence of permanent waterholes, mainly along the courses of creeks which rise in the sandhills and meander ultimately to the main channels of the Georgina or the Diamantina.

Some of the creeks are fed entirely by run-off from local rains while some receive water from bores or bore drains. They may flood and contribute to the waters that submerge flood plains, sometimes independently and sometimes concurrently with channel floods. Their main

importance, however, lies in the fact that they form many excellent permanent waterholes in the sandhill country (Plate 10). From the distribution of these waterholes, it would appear that drought losses in this type of country are seldom due to lack of water, but purely to lack of feed.

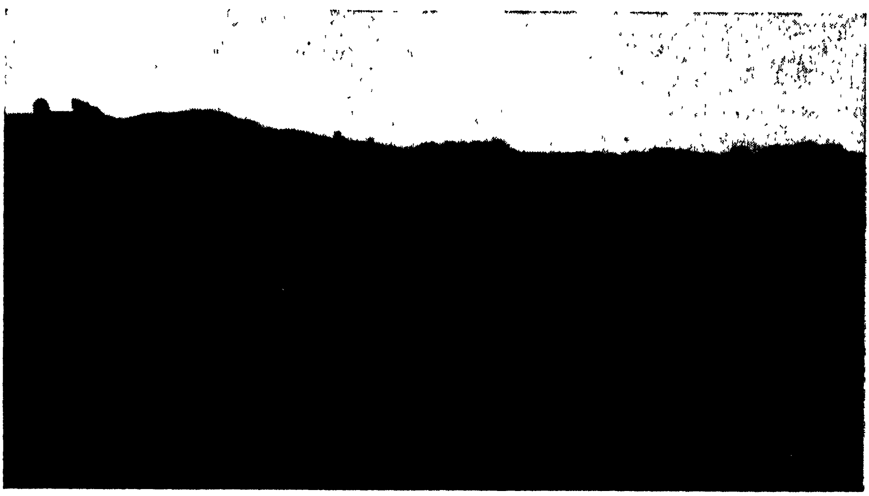


Plate 9.

AN EXCELLENT STAND OF MITCHELL, FLINDERS, AND BUTTON GRASSES ALONG THE FRINGE OF THE SANDHILL SLOPES, BETWEEN MONKIRA AND CLUNY.—This is non-flooded country; less than 3 inches of rain had fallen during the current season (January-July), but this portion of the run had not been stocked for nearly 18 months. Timber is mainly on ridges.

Plate 10.

A TYPICAL WATERHOLE ALONG THE COURSE OF A CREEK IN THE SANDHILL COUNTRY, DIAMANTINA WATERSHED.—The banks of this hole are fringed with coolibah. A valuable feature is the firm banks; they are somewhat sandy and even in drought times do not become boggy.

GENERAL REMARKS ON GEORGINA AND DIAMANTINA COUNTRY.

To one travelling through, the channel country of the two rivers and the flood plains are very similar and carry much the same vegetative cover. The significant difference in vegetation is the fact that "clover" grows in the channels of the Georgina but not of the Diamantina.

The "between rivers" or "off channel" country in the upper reaches is composed of gravelly or pebbly downs. In the lower reaches is the heart of the sandhill country. The general opinion of men with experience of both rivers appears to favour the Diamantina country as being better fattening country than the Georgina.

The flood frequency of the Diamantina is certainly better than that of the Georgina.

CLIMATIC CONDITIONS.

The significant feature of the rainfall figures is the low rainfall throughout the area, with a slightly higher average in the Diamantina country than the Georgina, an average of 9·97 against 6·75 in favour of the Diamantina.

Examination of the average monthly distribution reveals the fact that about half the year's rainfall falls in the first quarter, and the bulk of that in January and February. From March to September very little rain can be expected; what does fall is usually in the form of light showers and these may come in any month. During the last quarter, light but useful rains may be expected, and these are most likely to fall in November and December.

Obviously, the driest part of the year, when no useful falls can be expected, is in the third quarter, July-September.

Records were not obtained showing flood frequency in the Georgina, but information gathered indicates that an effective flood, providing useful channel feed, cannot be expected more than one year in four.

On the other hand, records of Diamantina floods indicate an effective flood every second year. No doubt, this is partly accounted for by the fact that the catchment of the upper reaches of the Diamantina is situated in areas of higher rainfall than is the catchment of the upper reaches of the Georgina.

Owing to the fact that most holdings have country which benefits both from channel floods and from local rains, periods of severe drought losses are not frequent. There have been occasions on which absence of channel floods has been compensated to some extent by useful local rains, and vice versa. However, when there is absence of both over two seasons, then disaster follows.

LAND TENURE.

Duration.

All holdings are leasehold and the average duration of leases is thirty years. Argument is sometimes advanced that insecurity of tenure restricts the amount which leaseholders are likely to spend on improvements. This may be true to a certain extent, but over a long period there has been practically no change in ownership of the various holdings, and over a period of 30 years there appears to be ample time to obtain adequate financial return for any expenditure on improvements.

Rentals.

These are subject to review on application by the lessee, and range from approximately 5s. per sq. mile up to 15s. per sq. mile.

Some of the country on the lowest range may be quite as good as that paying higher rentals but, in those cases, the extreme distances from transport facilities must be taken into consideration.

Lessees.

The entire area, which comprises the whole of the Diamantina and portion of the Boulia Shires, covering an approximate area of over 50,000 sq. miles, is held on lease by three companies. One of these has its headquarters in Brisbane, one in Sydney, and one in Adelaide.

It is obvious that the holdings in this part of the State are such that control by large companies with a spread of interests is the only method likely to be successful. A smaller landholder with a holding in this area as a single interest would, sooner or later, be dealt such a blow by seasonal conditions that recovery would be hopeless.

STATION MANAGEMENT.

Personnel Employed.

With one exception, the properties visited carried a resident manager, who was responsible to a general manager, who was also a director, or to a travelling manager in turn responsible to the general manager. The exception was the case of the principal of a company who was resident on and managed the principal station of the holdings.

As a general rule the manager is responsible for the actual running of the station and the management of the herds. In some cases, but not all, the manager is also responsible for the purchase of store cattle and herd bulls. He employs all labour and directs the activities of the station employees.

The lot of the manager is not an easy one and very little time is spent at the homestead. He usually camps with the stockmen on all mustering camps, during which times he lives as any other stockman. He attends, or arranges representation, at the general musters on adjoining holdings. Large numbers of travelling stock pass through most of the holdings, and it is the duty of the manager to see that such stock do not wander too far from the route, thereby destroying station feed and, more particularly, watering facilities.

The number of stockmen employed is not large. Even on properties running nearly 20,000 head of cattle, there are seldom more than six stockmen employed at any one time. Aboriginal stockmen are the exception; most places have none at all.

The stockmen spend practically all their time in mustering camps. They are either mustering for branding and marking, mustering fats for the road, mustering for movement from one part of the run to another, mustering for spaying, or mustering for movement of stores or breeders for sale.

A cow boy is usually employed for the performance of odd jobs about the station.

When available, a station cook is employed to do all the station cooking, and a musterers' cook for the camp cooking. It is not unusual, however, to find that the manager's wife, for a time, has to do the station cooking while the manager sometimes has to take a turn at musterers' cook.

On one property a mechanic was employed full-time to care for all mechanical equipment, but the manager is usually the mechanic, saddler, blacksmith, &c.

Areas and Carrying Capacities.

The average holding is from 2,000 to 2,500 square miles (largest holding 6,000 square miles) with a safe carrying capacity of from 3-4 beasts per sq. mile. As a general rule, places are stocked on conjecture as to what the following season will be. After having been ''caught'' at some time or another, most holdings now prefer to understock if anything.

Improvements, Including Watering Facilities.

Generally speaking, compared to the potential productivity value of the holdings, the expenditure on permanent improvements is small. There is practically no subdivision into paddocks beyond the provision of a horse paddock. There are no bullock paddocks for the holding of fats prior to going on the road; in some cases there are no boundary fences, and often where there is a boundary fence there is no wire in it.

Plate 11.

TYPICAL BRONCHO RAMP.—Most of the handling of cattle is done in broncho yards scattered throughout the run, usually handy to water that would be available for the mustering camp. The broncho ramp shown above is not in a broncho yard (which usually consists of a single yard with plain wire fence) but is in an old out-station yard on the Diamantina.

There is usually one set of main yards on the station, sometimes, but not always, another set at an out-station, and a series of broncho yards scattered throughout the run. A broncho yard consists simply of a single yard with plain wire fence, large enough to hold 200–400 head and containing a broncho camp (Plate 11).

The provision of watering facilities perhaps receives more attention than any other improvement and even these in some cases are kept down to an irreducible minimum. On the other hand, some properties are very keen to put down as much water as possible and it is only the permit system operated by the Lands Department (a very necessary control) that has prevented more bores being put down.

The area is all within the artesian basin, and good water is obtained at depths from 2,000 to 3,000 ft. giving a flow of 1,000,000 gallons per day. This flow is usually cut back to about 300,000 gallons. From the bore, the water may simply run into a large waterhole to provide permanent watering at that spot, it may be run out in a bore drain (Plate 12), or it may run into a natural watercourse to render a creek permanent. All bores are artesian and therefore there are no pumps, mills, troughing, &c., to be kept in order.

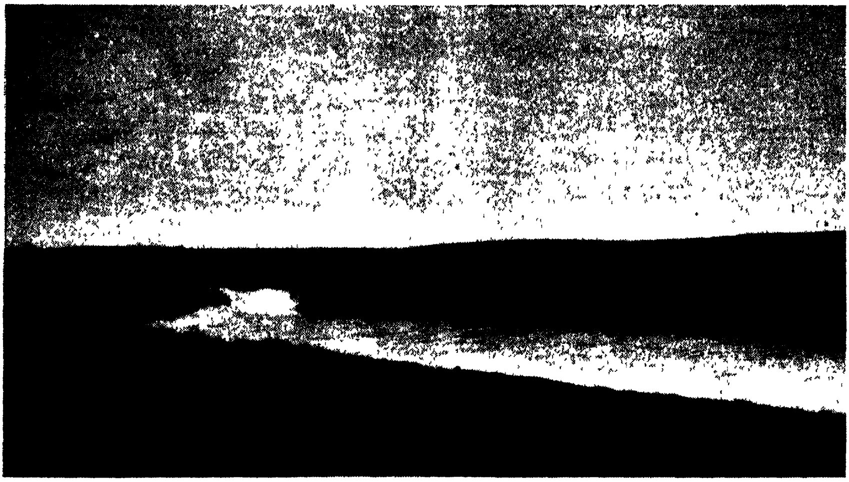


Plate 12.

BORE DRAIN ON PEBBLY DOWNS COUNTRY ON THE DIAMANTINA WATERSHED.—Grass along the fringe of the bore drain is water couch with little evidence of having been grazed. A giant nut grass also grows along the banks of the drain. Steer in the picture is approximately 18 months, a good type of polled Shornhorn that makes up into prime baby beef.

Earthen tanks are not used for storage, but recently a large tank was sunk in the middle of Lake Machattie. There has been no water in the lake since the tank was completed, so it is not yet known whether it will be successful or not.

It would appear that, provided sufficient monies were expended, the artesian supply in the area, as a whole, would be sufficient to make the present holdings quite safe as far as water is concerned.

[TO BE CONTINUED.]

PLANT PROTECTION

Topical Notes on Pest Control.

Contributed by the Entomology Section, Science Branch.

A SUBSTITUTE SPRAY FOR NICOTINE SULPHATE.

FOR many years market gardeners and orchardists have used and depended upon nicotine sulphate for the control of small soft-bodied insects such as aphids. The principal source of this useful insecticide has been America, but supplies were below requirements during the war when the price of the material increased and shortages were experienced. In many cases alternative and less efficient materials had to be used.

Unfortunately, the market position regarding nicotine sulphate has not improved since the war; in fact, owing to the dollar exchange position it is now somewhat worse. At present the use of such nicotine sulphate is restricted to those who are prepared to pay the very high price at which it is quoted and none is going into prepared insecticidal dusts used by vegetable growers.

Fortunately, a new substitute material is now available, and, provided that it is used with due care, insects such as aphids can still be controlled. The new insecticide is hexaethyl tetraphosphate.* This material is a dark-brown liquid which is diluted one part in 1,600 with water; that is, one fluid ounce to 10 gallons for normal use. The addition of a neutral spreader is desirable. Those using it should provide themselves with a suitable small glass measure so that the required quantities may be accurately and economically measured.

The material is quite stable in its concentrated form, but once it is diluted with water it commences to break down. Any mixed spray that remains standing rapidly loses strength. In using this material, therefore, it is essential that the spray mixture be applied immediately it is prepared, and it should be sprayed directly on to the insects, making sure for instance that the undersides of the foliage are reached by the spray. Hexaethyl tetraphosphate is valuable for the control of red spider and tomato mites as well as soft-bodied insects such as aphids.

As hexaethyl tetraphosphate is a comparatively new insecticide, not a great deal is known about the practicability of mixing it with other insecticides or fungicides. Wherever possible the spray should be used by itself, except, of course, for the addition of a spreader.

*This material is at present marketed in Queensland under the trade name of "Hexone."

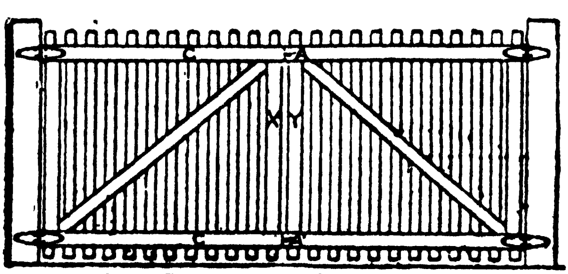
BROWN VEGETABLE WEEVIL.

The brown vegetable weevil is an introduced insect which attracts attention in winter and early spring as a pest of vegetables. The adult insect is, however, seldom seen by the grower, for feeding takes place at night. During the day both the adults and the larvae shelter in the soil and the more concealed parts of the plants. In practice, therefore, it may be assumed that vegetable crops with ragged and holed leaves on which no caterpillars can be seen are being attacked by this pest. As a check, a search in the ground near the base of some of the worst affected plants should bring to light the green legless grub, the somewhat whitish pupa or the greyish brown adult weevil.

Most of the damage in vegetable crops is caused by the larvae, but in spring and early summer, swarms of the adult may invade crops such as potatoes, and vegetable growers should both expect attacks and be prepared to apply control measures promptly in the early stages of an outbreak. As a first step, it is wise to keep weed growth suppressed; the insect feeds on a variety of plants and dense weed growth is bound to attract it. The next step is to apply a DDT dust or spray as soon as the damage is observed. Generally the spray gives better results than the dust and it should be used whenever possible. DDT preparations suitable for controlling the brown vegetable weevil are available in Queensland. Spray concentrations of the emulsion or dispersible powder types are added to water according to the manufacturer's specifications. The dusts usually contain 2 per cent. DDT and are applied as received in the container. One or two treatments should be sufficient for the average crop.

TO HANG A DOUBLE GATE.

A simple and easy method of constructing and hanging a double gate so that it will swing perfectly true when completed, is shown in the accompanying sketch. Make the gate in one piece by running the cross-pieces C from one post to the other. Leave a small space between the upright pieces X and Y, so that they will swing free of each other when the gate is cut in two. Hinge the gate to the posts at all four corners, testing the cross-pieces with a level. Then saw the gate in two at A and A, and the two halves will swing perfectly true and match each other.



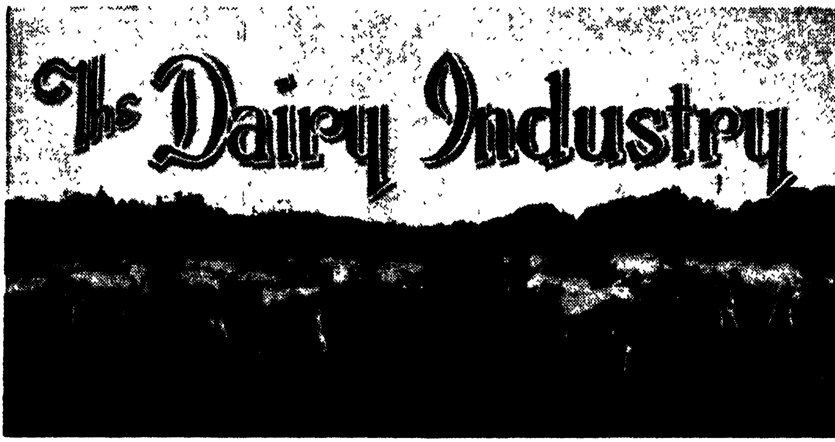
GATE READY TO BE SAWN IN TWO.

AN IMPROVISED FLOOR CRAMP.

Mr. R. A. Ward, of Wellington Point, writes that he has used a car jack for cramping floors when the ordinary floor cramp is not available. A 15-inch length of 3 x 1½ hardwood, with 2 fibro fluted nails protruding ½-in., is held on the joist by means of a small D cramp and the jack pushes from the end of this hardwood piece.

Plate 13.

AN UNUSUALLY LARGE CLUSTER OF CUSTARD APPLES.—There were 37 fruits in this cluster from a tree of the Pink Mammoth variety in Mr. D. H. Morton's orchard, Rob Roy, Coochi Mudlo Island, Moreton Bay. The tree was propagated by a former Director of Fruit Culture, the late A. H. Benson, and planted in 1914. It has always been a prolific bearer—as much as 26 cases in one crop. In the last eight years it has had no pruning, except for the removal of dead wood. The height of the tree is 25 feet and it has a 40-ft. spread; it has never been fertilized.



Points in Dairy Practice.

V. J. BRIMBLECOMBE, Senior Dairy Adviser.

ON a considerable number of dairy farms it is quite apparent that very little thought has been given to planning of the farm lay-out. Consequently much valuable time and money is lost, and annoying inconvenience caused by difficulties encountered through this lack of a proper farm plan.

On some farms where facilities are well established and substantial it would be too expensive to conform to an ideal plan. However, it may be possible at little cost to improve or modify an existing establishment and provide more pleasant and profitable working conditions. On farms where facilities are more or less makeshift or haphazardly sited and general reorganisation is required, and also on properties on which dairying is about to be established, too much consideration cannot be given to planning for the best working conditions.

Dairying, as is well known, is an occupation to which constant attention has to be given every day of every year. To brighten and lighten this perpetual day-in and day-out routine, the following points on dairy planning and herd management are submitted for consideration.

Farm Lay-out.

Assuming that the dairy farm is situated in a recognised dairying district, and the soil is reasonably fertile, the first essential is a good, permanent water supply, preferably a running stream or an underground supply of good quality and ample quantity. On the location of the water supply will largely depend the choice of site for the necessary buildings. The building site should be high enough to ensure adequate drainage, and reasonably close to the main roadway entrance. The property should be subdivided into paddocks of ten to fifteen acres in area, and provision made for convenient laneways for rotational grazing and cultivation. Sound stock-proof fencing should be provided for all

boundary and subdividing fences with well-constructed gates so situated as to give the required ease of entry to the respective paddocks. On hilly country the fences should, as near as practicable, follow the contour of the slopes so that strip-cropping and contour-farming may be practised to prevent soil erosion.

Farm Buildings.

The farm buildings should be substantial in construction and of adequate dimensions for the purpose required; they should be laid out systematically and provision made for shelter trees and ornamental shrubs to form a fitting background. The dairy buildings should have a north-easterly aspect and be so situated as to enable the stock to be quietly and conveniently handled from the various paddocks, without excitement or bother. The milking shed and appurtenances should be so constructed as to ensure highest quality production of milk and cream. Essentials are well-constructed, combined dairy building lay-out including milking shed, engine room, separator or milk room, and an airy ventilated cream room or milk stand. Floors should be cemented and adequately drained. A plentiful supply of water should be available, together with proper cleansing and sterilizing facilities at the dairy premises. These include a steam sterilizer or twelve-gallon bricked-in boiler, wash-up trough, draining racks and the necessary equipment.

The whole of the dairy premises and surroundings should be kept clean and tidy to indicate pride of ownership. Manure accumulations in the yards and around the dairy buildings should be removed daily. This valuable fertilizer should be saved for distribution into cultivated paddocks. Dairy work should be done quietly and speedily and a high standard of efficiency should be the aim in all operations. Calf-feeding pens and piggery, should be conveniently situated and facilities provided to minimise the work entailed. Cement feeding floors are necessary to maintain sanitary conditions in the piggery. A proper feeding routine and suitable accommodation are also necessary to ensure profitable returns.

The Dairy Herd.

The dairy herd is the next consideration and in this respect two courses may be followed: Either a stud herd or a commercial grade herd may be established.

In selecting the breed of dairy stock several factors have to be considered, viz., area of the farm, type of country, climatic conditions, and the market to be supplied.

In the establishment of a stud herd it is not always possible, because of lack of finance, to purchase a complete foundation herd of purebred cattle. If this be so, it is advisable to commence the stud in combination with a grade herd. The stud animals should be the best obtainable, even though the number be few, rather than a large number of inferior animals. One important essential is a high-class sire whose blood lines are similar to those of the foundation females. After a few generations. by careful selection and culling, a complete stud of high-class stock can be established on sound breeding lines.

In establishing a grade herd, it is advisable to select a line of good-quality dairy heifers near to freshening; and in this case also a pure-bred sire from a cow of known production, and of the breed selected, should head the herd. To maintain a grade herd on sound lines a systematic herd testing programme should be adopted and when applied scientifically in selection and culling, and by the use of proven sires, a herd of high production attainment should be the outcome after a few generations. The herd sire or sires should be kept in a suitable paddock near to the milking yards, and not allowed to roam with the herd. If more than one sire is retained, a suitable breeding programme may be practised. Particular attention should be given to the keeping of service, calving and production records.

The health of the dairy herd should not be overlooked, as many diseases may impair production often for a considerable period. A veterinary chest with instruments and medicines for immediate use should be provided. All medicines should be suitably labelled to prevent incorrect use, and poisonous specifics should be kept under lock and key. Cleansing and sterilization of surgical instruments should receive proper attention. A hospital paddock where sick animals may be kept under observation is also an advantage, and a convenient crush for the handling of stock is essential.

Fodder Conservation.

No dairy farm is complete without some organised system of fodder conservation. No matter how well-bred cows may be, if they do not receive sufficient food of the right quality to maintain their milk flow and to keep them healthy the best results cannot be achieved. Permanent pastures should be established and properly maintained by judicious stocking and renovation. Suitable cultivated crops should be provided to supplement the pastures and to ensure a reserve of fodder in the form of hay or silage for the ever-recurring drought periods. A paddock of lucerne is an invaluable asset on all dairy farms. A reserve of suitable feeding grain is also desirable. After crushing, it can be fed when roughage is dry with beneficial results in the stimulation and maintenance of production. Cows grazing on over-succulent fodder should be provided after the evening milking with a ration of good-quality, grassy lucerne hay to prevent scouring, and restriction of cud-chewing when the grazing is over-sappy.

Convenient feeding-stalls lessen the labour involved in hand feeding and also enable the farmer to ration concentrates on individual production. Milking cows and young stock, especially springers, should at all times be kept in good condition, so that when freshening they are in a state of health to give maximum production immediately. Over-stocking on a dairy farm should never be practised; in the long-run it is false economy.

It may take several years to institute an ideal dairy-farm lay-out and to build up and maintain a dairy herd of high production, but when progress can be achieved by working to a definite plan towards the ideal required, pleasure and profit will be the just reward.

Using Herd Recording Results.

S. E. PEGG, Senior Adviser (Herd Testing).

HERD recording is of little value unless the information gained is used in a practical way.

One of the first uses to be made of the records is their value when culling the herd. Naturally the farmer will cull the lowest-producing cows, but when consulting the production records of each cow the owner should consider the conditions under which the records were produced, viz., seasonal conditions prevailing, the age of the cow, the health of the cow, and the month of calving.

Most farmers can profitably cull a percentage of their lowest producers, and the remainder of the herd would benefit by the increased feed available. When culling, each man should cull all animals below some standard of production and endeavour to increase this standard each year.

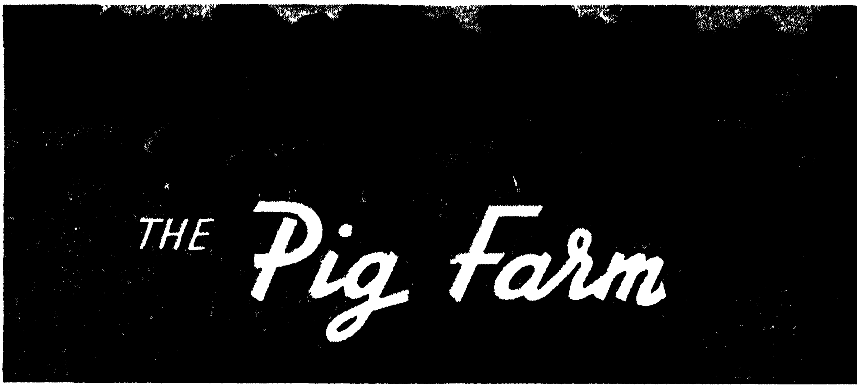
Figures taken from the State Grade Herd Recording Scheme over a number of years show that the average production per cow is approximately 150 lb. butterfat, and of the number of cows tested 14 per cent. produced below 100 lb. butterfat, and 40 per cent. between 100 and 150 lb.; that is, 54 per cent. of the tested cows produced less than 150 lb. butterfat. This means that if a fixed standard of 150 lb. were laid down, on an average each farmer would have to cull 54 per cent. of his herd. Some farmers would have only a few to cull, but others would need to cull the entire herd. Obviously, such a practice may be uneconomical as many farmers may not have enough capital to buy a new herd. Therefore, it is suggested that each man should set his own standard and gradually raise it each year.

It should be remembered that the culling of low producers will not raise the standard of production to any appreciable extent unless it is associated with better feeding methods and replacement by the progeny of higher producers. Again, this calls for the use of production records, as the records enable the owner to select as replacements the progeny from the highest producing cows.

Herd recording plays another very important part in the economy of the industry by enabling the farmer to ascertain the capabilities of the bull to transmit production capacity to his heifers. The heifers should be tested as soon as they calve, and the information gained will determine whether the bull should be kept or not.

Monthly testing is particularly valuable when the farmer is feeding his cows, for he is able to ascertain the reaction of each cow to the feed given; and by feeding according to each cow's production, greater use is made of the available food. A man feeding the same amount to each cow overfeeds poor producers and underfeeds the better ones.

Herd recording also enables a farmer to keep a check on his own standard of husbandry. Comparison of results with others in the same district enables him to get an idea of the standard of his methods and his herd.



Pig Carcass Competitions.

THE Australian Meat Board in association with the Department of Agriculture and Stock and with the co-operation of all sections of the industry has completed a baconer pig carcass competition on a district basis. Judging and field days were conducted at Mareeba, Rockhampton, Toowoomba, and Brisbane.

Prize winners in their respective districts were:—

—	Breed.	Total Points.	Percentage.
	MAREEBA.		
1st—H. J. Williams, Yungaburra	Canadian Berkshire x Large White	99 & 96 195	78
2nd—J. C. Carson, Malanda..	Large White x Saddleback x Berkshire	97 & 96½ 193½	77·4
3rd—W. Hastie and Sons, Atherton	Canadian Berkshire ..	98½ & 89½ 188	75·2
	ROCKHAMPTON.		
1st and Champ.—V. E. Jones, Kalapa	Canadian Berkshire ..	98½ & 97½ 196	78·4
2nd—A. W. Hodgkinson, Koongal	Berkshire x Large White ..	96 & 85½ 181½	72·6
3rd—G. White, Ridgelands ..	Large White x Canadian Berkshire	91 & 89½ 180½	72·2
	TOOWOOMBA.		
1st—H. J. Franke & Son, Crow's Nest	Large White, x Large White x Berkshire	99½ & 89½ 189	75·6
2nd—E. C. Mengel, Mount Kent	Canadian Berkshire x Saddleback x Tamworth	94½ & 90 184½	73·8
3rd—Roushte Bros., Ravensbourne	Large White	95 & 88 183	73·2
	BRISBANE.		
1st—Kingston Stud Piggery, Kingston	Large White x Large White grade	86½ & 85 171½	68·6
2nd—A. E. Snare, Forest Gate Stud, Rosevale	Tamworth	80½ & 70½ 160	64
3rd—N. E. Meyers, Kallangur	Large White	85½ & 70½ 156	62·4

The championship was awarded to Mr. V. E. Jones, of Kalapa, via Rockhampton, for a team of two Canadian-type Berkshire pigs which were awarded 98½ and 97½ points respectively, a total of 196 or 78.4 per cent. These carcases were of very good type and scored well in all points. They were nicely balanced and evenly proportioned, well fleshed with an even covering of good quality fat. An interesting factor was that they were produced under full grazing conditions.

Although the competitions were successful, the number of entries was somewhat disappointing. However, because of unavoidable circumstances it was not possible to make known the conditions or date of the competitions in time to allow possible exhibitors the necessary period to select or breed suitable pigs. It is expected that a considerable increase in entries will come from all centres next year.

Generally, bearing in mind the time factor, the average quality of the carcases was good and may be taken as representative of the pigs produced in each district. This argues well for the success of future competitions and an improvement in the general standard may be expected.

At Mareeba arrangements were made by the District Adviser, Pig Branch (Mr. T. Abell), in association with the Manager of the North Queensland Bacon Association (Mr. Dunlop), to hold a field day at the factory, at which approximately 40 farmers attended. Seven entries were available for judging, the carcases being presented in a very fair condition, but farmers were advised that more care would have to be taken in the handling and transport of their pigs to the factory. Body length and development of eye muscle were the main points needing attention. Carcases generally were short and eye muscle developmnet poor in some cases. Streak and backfat were very fair, but hams and shoulders require attention.

At Rockhampton the arrangements for the field day, at which 50 farmers attended, were made by Mr. Ross Nott, Divisional Veterinary Officer, in collaboration with the management of the C.Q.M.E. Co. Ltd. who also provided lunch. Fourteen entries were received and the presentation of the pigs was something of which to be proud. The dressing was excellent and the whole organisation could not have been bettered. The chief faults revealed in the judging were a deficiency in the hams, which could have been better developed. Body length was short and in several cases fat development was excessive.

At Toowoomba, arrangements were made by the District Adviser, Pig Branch (Mr. C. Porter), together with the management of the Darling Downs Co-operative Bacon Association, at whose factory facilities were made available for judging, and a field day arranged at which 60 farmers attended. Sixteen entries were received and, as elsewhere, body length and eye muscle development were the main features requiring improvement. The thickness of backfat was very fair, although streaks could have shown a greater percentage of lean meat.

At Brisbane, it was decided to carry out the judging on Monday, 31st May, 1948, and to hold the field day in conjunction with the awarding of the championship on Wednesday, 2nd June, 1948. The arrangements were made by Mr. E. L. Melville, Senior Adviser, Pig Branch,

in association with the Queensland Meat Industry Board, the Australian Meat Board, Department of Commerce and Agriculture, Darling Downs Co-operative Bacon Association, Doboy, and Queensland Co-operative Bacon Association, Murarrie. Eight entries were received and carcases were well presented for judging. Body length was short, however, and eye muscle development required considerable attention; backfat in most cases was too thick and extended well into the streak.

Approximately 100 people attended the field day at the Abattoir, where arrangements were made for an inspection of the works before lunch, which was provided by the Queensland Meat Industry Board. Addresses were given by Mr. P. Becker, Queensland representative of the Australian Meat Board (who presided), Mr. E. L. Melville, Senior Adviser, Pig Branch, Department of Agriculture and Stock, Mr. E. Reid, Veterinary Officer, Department of Commerce and Agriculture, Mr. G. Tomlins, Works Superintendent, Queensland Meat Industry Board, and Mr. F. Bostock, Officer in Charge of Pig Branch, and Competition Judge.

The State Championship trophy was presented by Dr. A. R. Haywood, Pig Producers' representative of the Australian Meat Board.

COLONIES TO FEED EUROPE.

In the light of the recent agreement between the British and Queensland Governments for the development of grain sorghum—pig production in Central Queensland, an article appearing in "Foreign Agriculture" for March, 1948, is interesting. The authors point out how European countries having overseas territories are making efforts to expand food production in them. The plans tend to emphasise the particular crops to which an area is believed to be best suited, or the production of which seems capable of being expanded rather rapidly by large scale development. Important among the commodities emphasised are vegetable oils, rice and cocoa. In a number of cases, however, other grains, fruits and vegetables, or dairy and other livestock products are included in part by way of providing more adequate local food supplies as a means of improving labour supplies and the living conditions of the people.

Projects mentioned in the article include Belgian plans to increase production of vegetable oils, such as palm, palm-kernel, cottonseed and peanuts in the Belgian Congo; French plans for irrigation and drainage in Madagascar, and expansion of peanut, rice, palm and palm-kernel oil, and cocoa production in French Africa; Dutch attempts at restoration of copra and palm-oil production in the Netherlands East Indies; and British programmes for intensive production of foodstuffs in British East Africa, British West Africa, the Rhodesias, Nyasaland, Malaya, Solomon Islands and British Caribbean region, particular emphasis being placed on such crops as cocoa, peanuts, soybeans, wheat and rice.

UNLABELLED WATER SAMPLE.

A small essence bottle of water carrying a label of the Port Curtis Co-operative Dairy Association Ltd., Wowan, was left at the Head Office of the Department on May 31 without any details as to its origin. The person who left this sample is requested to send a beer bottle full for analysis, together with his name and address and details of the water supply.

ANIMAL HEALTH

Control of Worm Parasites of Sheep.*

H. McL. GORDON, McMaster Animal Health Laboratory, Sydney.

SUPPLIES of drenches are now generally adequate but it is still advisable to conserve supplies. Drenches are more expensive than in the pre-war period. Control methods should aim at preventing outbreaks of parasitic diseases rather than curing them after losses have occurred. Reduction in the amount of handling and drenching of sheep must be an objective in all control measures.

The practical problems the grazier has to overcome in controlling worm parasites in his sheep are discussed in the following pages.

MAKING THE BEST USE OF DRENCHES.

Supplies of carbon tetrachloride, nicotine sulphate, phenothiazine and tetrachlorethylene, all short during the war period, are now generally adequate, but it is still wise to conserve these drugs and to consider their costs.

Phenothiazine.

Although the cost of phenothiazine is still considerable, it is largely offset by the marked superiority of the drug. Phenothiazine should be used especially to prevent outbreaks due to the nodule worm and small intestinal worm. It should not be used indiscriminately. The times to use phenothiazine are discussed later (see Drenching at Strategic Periods, page 40).

Bluestone-Nicotine.

This mixture has long been used indiscriminately as a treatment for "worms." It is relatively expensive and nicotine is still scarce. It should, therefore, be reserved for treatment of young sheep, particularly weaners, suffering from small intestinal worm. Do not use bluestone-nicotine mixture for treatment against large stomach worm. It is no more effective against large stomach worm than bluestone-arsenic mixture, which is much cheaper. Bluestone-nicotine mixture is not always highly efficient against small intestinal worms in all sheep, but if it is used at strategic periods it gives a satisfactory measure of control. It is likely to fail in a bad outbreak. Under such circumstances, use phenothiazine, if not for the whole flock, at least for the "tail."

Carbon Tetrachloride.

This drug, which is essential for treatment against liver fluke, is commonly used for treatment against large stomach worm, but in view of the unpredictable losses which sometimes follow its use and the

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* Published by arrangement with the Commonwealth Council for Scientific and Industrial Research.

cheapness of bluestone-arsenic mixtures which can replace it as a treatment for large stomach worm, there is good reason to restrict its use.

Bluestone-Arsenic.

This is a cheap and effective treatment against large stomach worm and, provided mixtures are properly made and the recommended dose rate is strictly followed, it is quite "safe."

It is particularly useful for the control of large stomach worm in grown sheep. For young sheep, bluestone alone may be used but the bluestone-arsenic mixtures are preferable.

Bluestone alone is not very effective against the large stomach worm in grown sheep unless the usual dose rate is increased (see dose rate later in these notes), and further, bluestone is not effective against immature worms. Bluestone-arsenic mixture is much more effective.

Drenches containing bluestone alone, bluestone-nicotine or bluestone-arsenic are effective against large stomach worms in about 90 per cent. of sheep. They fail in the other 10 per cent. because they are swallowed into the paunch instead of into the fourth stomach. Carbon tetrochloride and phenothiazine are the only two drugs known to be effective against large stomach worm when swallowed into the paunch, and either of these may be used successfully to treat the sheep which fail to respond to bluestone mixtures. Under normal conditions phenothiazine or carbon tetrachloride could be used as an alternating treatment, if not for the whole flock then for those sheep which fail to respond to other treatments. The minimum effective dose of phenothiazine against large stomach worm is between 5 and 10 grammes. A 10 gramme dose (48 sheep to the pound of phenothiazine) is almost certainly 100 per cent. efficient against this parasite. A 5 gramme dose is highly effective. Double strength mixtures of carbon tetrachloride should be used; that is, each sheep should receive 2 c.c. of the drug mixed with 3 c.c. liquid paraffin.

Tetrachlorethylene.

When this drug is given with, or immediately after, a dose of bluestone solution it is very effective against large stomach worm. It is more effective than bluestone-nicotine against small intestinal worm and although it sometimes causes staggering, or even temporary unconsciousness, the sheep soon recover if protected from injury by their fellows.

PREPARATION AND USE OF DRENCHES.

Phenothiazine.

This drug is marketed as "Phenovis," "Phenzeen" and "Phenovine" in the form of a powder which mixes with water to form a suspension suitable for drenching. Ready prepared suspensions are also available.

Non-automatic drenching syringes are commonly used for the administration of phenothiazine suspensions. Automatic drenching apparatus has in general not been satisfactory for use with phenothiazine, but the "Palm Drenching Gun" and the "Victor Drenching Apparatus" are very satisfactory. Whatever type of instrument is used, a nozzle

about 6 inches long is required so that the dose can be placed well back over the tongue, thereby avoiding slobbering, which leads to staining of the wool.

A double bucket, like that shown in Plate 14, is useful when using a syringe. One side of the bucket contains phenothiazine and the other side water, which is used to rinse the nozzle before a sheep is drenched. If the nozzle is not rinsed, phenothiazine suspension will drip and stain the wool. Fresh rinsing water should be used for each race full of sheep to be drenched.

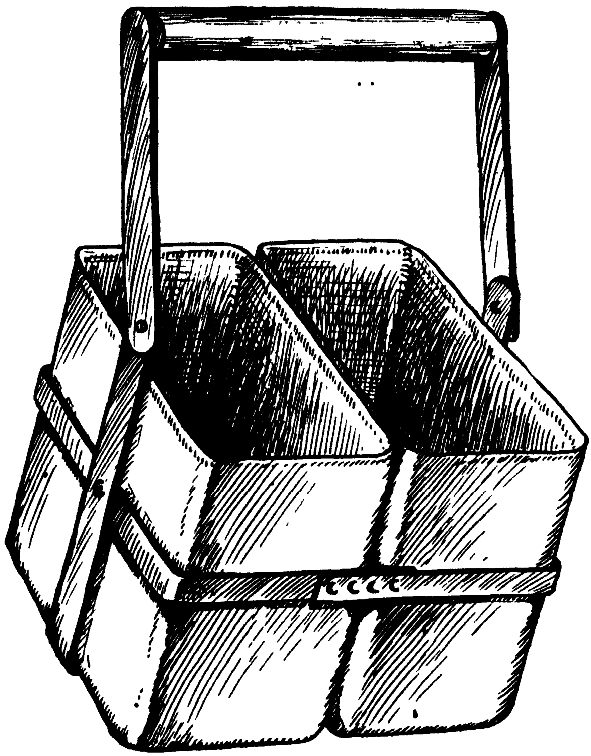


Plate 14.
DOUBLE BUCKET FOR DRENCHING WITH PHENOTHIAZINE.

Preparation of Phenothiazine Drench.

The powder is usually packed in 1 lb. and 7 lb. containers. The simplest way is to take 1 lb. of powder and add water gradually, stirring thoroughly to produce a creamy suspension, finally making the quantity of the mixture up to the required amount for the number of sheep to be dosed per pound. Finally, run the mixture through a fine sieve such as a double thickness of fly-wire.

As an example, suppose that weaners are to be dosed at 30 per pound. Take 1 lb. powder and add water, mixing thoroughly, so that eventually there is 30 fl. oz. (1½ pints) of mixture; that is, 30 doses at 1 fl. oz. each. Similarly, if a 7 lb. lot of powder is to be mixed, add water until the suspension measures 210 fl. oz. (10½ pints). Occasionally when the requisite amount of water has been added the mixture is too thick for use with drenching syringes. Extra water must then be added

until the mixture is sufficiently thinned for use. When this has been done the amount of mixture must be measured and adjustments made so that the correct dose will be given to each sheep.

A measuring jug marked in fluid ounces and pints is of great assistance in making up phenothiazine, and indeed, all drenches.

The Dose Rate.

In order to obtain high efficiency against the small intestinal or hair worm (known also as black scour worm), use 1 lb. phenothiazine powder for 20 grown sheep, 25 young sheep 8-12 months old, or 30-40 weaners 4-8 months old. The higher the dose, the greater the efficiency, and as it is particularly necessary to obtain a good kill of these worms in young sheep, it pays to dose only 30 weaners per pound of powder.

MIXTURES AND DOSES OF PHENOTHIAZINE FOR USE AGAINST SMALL INTESTINAL WORM.

Dose.	Amount of Phenothiazine.	Add Water until Mixture Measures.
	For Weaners 4–8 months old, at 30 per lb.	
25 c. c.	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
30 c. c. (1 fl. oz.)	1 lb.	30 fl. oz. (1½ pints)
	7 lb.	210 fl. oz. (1 gall. 2½ pints)
	For Young Sheep 8–12 months old, at 25 per lb.	
30 c. c. (1 fl. oz.)	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
35 c. c. (2 x 17½ c. c.)	1 lb.	29 fl. oz. (1½ pints)
	7 lb.	203 fl. oz. (1 gall. 2 pints)
40 c. c. (2 x 20 c. c.)	1 lb.	33 fl. oz. (1 pint 13 fl. oz.)
	7 lb.	231 fl. oz. (1 gall. 3½ pints)
	For Grown Sheep, at 20 per lb.	
40 c. c. (2 x 20 c. c.)	1 lb.	26½ fl. oz. (1 pint 6 fl. oz.)
	7 lb.	185½ fl. oz. (1 gall. 1¼ pints)
50 c. c. (2 x 25 c. c.)	1 lb.	33 fl. oz. (1 pint 13 fl. oz.)
	7 lb.	231 fl. oz. (1 gall. 3½ pints)
60 c. c. (2 x 30 c. c.)	1 lb.	40 fl. oz. (2 pints)
	7 lb.	280 fl. oz. (1 gall. 6 pints)

MIXTURES AND DOSES OF PHENOTHIAZINE FOR USE AGAINST NODULE WORMS.

Dose.	Amount of Phenothiazine.	Add Water until Mixture Measures.
	For Weaners 4–8 months old, at 40 per lb.	
20 c. c.	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
30 c. c. (1 fl. oz.)	1 lb.	40 fl. oz. (2 pints)
	7 lb.	280 fl. oz. (1 gall. 6 pints)
	For Young Sheep 8–12 months old, at 30 per lb.	
25 c. c.	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
30 c. c. (1 fl. oz.)	1 lb.	30 fl. oz. (1½ pints)
	7 lb.	210 fl. oz. (1 gall. 2½ pints)
	For Grown Sheep, at 25 per lb.	
30 c. c. (1 fl. oz.)	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
40 c. c. (2 x 20 c. c.)	1 lb.	33 fl. oz. (1 pint 13 fl. oz.)
	7 lb.	231 fl. oz. (1 gall. 3½ pints)

Staining of the Wool should be Avoided.

One disadvantage in the use of phenothiazine is that it stains the wool. This is brought about in several ways, namely (i) from drippings from the nozzle of the drenching syringe or pistol, (ii) by the soiled hands of the person drenching, (iii) by the soiled mouth of the drenched sheep when wiped on another sheep, and (iv) by the phenothiazine passed in the urine. *Staining can be avoided by observing the following precautions*:

1. Rinse the nozzle in water immediately after filling the syringe with phenothiazine. The double container already mentioned provides water for this purpose, as well as for periodical flushing of the instrument. The water container must be emptied out and refilled with clean water periodically because it soon comes to contain phenothiazine from rinsing the nozzle and drips of it will then stain the wool. There is, of course, still some dripping from the nozzle, but if rinsing water is renewed after each batch of sheep in the race is drenched the amount of staining is very slight. Dripping can be almost eliminated by using a wiper attached to the container. A small roll of cloth or sacking attached to the rim of the water container is sufficient to remove the excess rinsing water from the outside of the nozzle of syringe. Instead of, or in addition to, the rinsing of the phenothiazine from the nozzle, a special wiper may be used. A suitable wiper consists of a piece of felt or Feltex held between two pieces of sole rubber or leather. In both the rubber or leather, and the felt, are cut U-shaped notches, those in the felt being smaller than those in the rubber or leather. The wiper is rivetted to two pieces of tin or iron which form a sliding grip to attach the wiper to the side of the drench container. The wiper can be removed easily and washed free of phenothiazine from time to time. This type of wiper may be used instead of rinsing water, or in addition to it.

2. Carry or hang several pieces of cloth near the race so that the hands can be wiped periodically. Usually the left hand becomes soiled when a sheep slobbers the dose.

3. The race should be open behind the man drenching so that the sheep can go into a roomy yard immediately. If they are packed in the race or a small yard there will be a great deal of staining from the mouth rubbing on the sides or rumps of other sheep.

4. Do not hold sheep in yards more than an hour or so after drenching. It is unwise to muster, hold or drive them during the three days after drenching. Urine staining is of little consequence if these precautions are taken.

When an automatic apparatus is used there is practically no dripping from the nozzle, but the other precautions listed should be observed.

It is well worth noting that many millions of sheep have been drenched with phenothiazine in various parts of the world without any ill-effects. Recently, however, in both New South Wales and Queensland, reports have been received that the drug has caused the death of the foetus when in-lamb ewes are treated within a fortnight of lambing. For this reason, it may be advisable not to use this drug within a month before lambing.

It is, of course, inadvisable to use any kind of drench when ewes are advanced in pregnancy, as pregnancy toxaemia or hypocalcaemia may result from the yarding and temporary starvation that is involved.

Treatment of ewes before lambing is essential to reduced contamination of pastures with worm eggs and thereby protect the lambs. Two treatments, one at two months and the other not less than one month before lambing are usually advisable.

Bluestone.

Bluestone solutions can be readily prepared, the only precautions being to use exact, carefully weighed quantities, and glass, copper, wooden, or earthenware containers. Old car battery containers are useful. Mixtures and dose rates are:—

(i.) Two per cent. solution—Dissolve 1 lb. bluestone in 5 gallons of water.

Doses—

Grown sheep ..	4 fl. oz.	(specially increased dose)
Sheep 12-18 months..	1½ fl. oz.	(45 c.c.)
Sheep 8-12 months ..	1 fl. oz.	(30 c.c.)
Sheep 4-8 months ..	¾ fl. oz.	(25 c.c.)
Lambs under 4 months	½ fl. oz.	(15 c.c.)

(ii.) Four per cent. solution—Dissolve 1 lb. bluestone in 2½ gallons (or 2 lb. in 5 gallons).

Doses—

Grown sheep ..	2 fl. oz.	(specially increased dose)
Sheep 12-18 months..	¾ fl. oz.	(25 c.c.)
Sheep 8-12 months ..	½ fl. oz.	(15 c.c.)

For younger sheep use 2 per cent. solution.

Bluestone-Nicotine.

Many ready-for-use preparations of bluestone-nicotine are on the market. Mixtures are however, readily and cheaply made. Use a 2 per cent. solution for younger sheep and a 4 per cent. solution for older sheep. A 2 per cent. solution is made by dissolving 1 lb. bluestone in 5 gallons of water and adding 16 fl. oz. nicotine sulphate (commercial Black Leaf 40). A 4 per cent. solution is made by dissolving 1 lb. bluestone in 2½ gallons of water and adding 16 fl. ozs. nicotine sulphate.

DOSE RATES.

Age.	2 per cent. Solution.	4 per cent. Solution.
Grown sheep	2 fl. oz. (60 c. c.) ..	1 fl. oz. (30 c. c.)
Sheep 12–18 months	1½ fl. oz. (45 c. c.) ..	¾ fl. oz. (25 c. c.)
Sheep 8–12 months	1 fl. oz. (30 c. c.) ..	½ fl. oz. (15 c. c.)
Sheep 4–8 months	¾ fl. oz. (25 c. c.) ..	⅜ fl. oz. (12 c. c.)
Lambs under 4 months ..	½ fl. oz. (15 c. c.) ..	¼ fl. oz. (8 c. c.)

If the weather is very hot or if the sheep are in very poor condition, or if severely anaemic, reduce the amount of nicotine from 16 fl. oz. to 12 fl. oz. for the first dose, or until the sheep improve in health and/or the weather cools.

Bluestone-Arsenic Mixtures.

(1) Bluestone-Arsenite of Soda.

Dissolve ½ lb. bluestone in 1 gallon of water. Dissolve 2 oz. arsenite of soda containing 60-65 per cent. As_2O_3 in 1 gallon of water. Mix these solutions and a green, cloudy sediment forms. This is cleared by adding 1½ fl. oz. spirits of salts (commercial hydrochloric acid). Finally, make up to 3 gallons with water.

(2) Bluestone-Arsenic Pentoxide.

Dissolve ½ lb. bluestone and 1½ oz. arsenic pentoxide in 3 gallons water. There should be no sediment. Make sure that the pentoxide will dissolve in water.

Doses for both mixtures are—

Grown sheep	1 fl. oz.	(30 c.c.)
Sheep 12-18 months ..	¾ fl. oz.	(25 c.c.)
Sheep 8-12 months ..	½ fl. oz.	(15 c.c.)
Sheep 4-8 months ..	⅜ fl. oz.	(12 c.c.)
Lambs under 4 months ..	¼ fl. oz.	(8 c.c.)

If bulkier doses are preferred—and they are desirable for sheep younger than twelve months--use the same amounts of arsenic preparations as above but *double* the amount of bluestone and *double* the amount of water. The dose rates will be *double* those given above.

When accurate scales for measuring small quantities are not available the following method can be used:—

(i.) Make a stock solution of arsenic pentoxide by dissolving 1½lb. in 10 pints of water (or 1 lb. arsenite of soda (60-65 per cent. As_2O_3) in 8 pints);

(ii.) Dissolve ½ lb. bluestone in 1 gallon of water;

(iii.) Mix this bluestone solution with 1 pint of either of the arsenic solutions.

(iv.) Make up the mixture to 3 gallons with water;

(v.) If arsenite of soda is used, add 1½ fl. oz. spirits of salts;

(vi.) Strain the mixture through a piece of cloth.

The doses given should not be increased. They are effective, and an increase is likely to kill the sheep. Remember, that bluestone-arsenic mixtures are effective only against large stomach worm (*Haemonchus*) and should be used, therefore, from the early spring to autumn. In winter, use bluestone-nicotine for young sheep. It is advisable to strain all drenches containing arsenic through a piece of cloth before use. This is in case there is any undissolved arsenic present.

Arsenical Poisoning.

If used according to the directions given, the mixtures containing arsenic should be perfectly safe for sheep. The dose rates must be strictly followed. Be sure that all of the arsenical preparation used dissolves completely. If there is any sediment, strain off through a bag or cloth. If a sediment is noticed in the bottom of the container after using most of the drench, do not use the remaining solution. Mixtures should be stirred frequently during drenching. Sheep should not be starved before treatment but should be kept away from water for two or three hours

after drenching. If sheep show ill-effects after the use of drenches containing arsenic, use the following antidote:—1 to 2 teaspoonsful of "hypo" (sodium thiosulphate, used in photography) dissolved in a half-cup of water. Swab the mouth, or drench with a few c.c. of 5 per cent. bluestone, before giving the "hypo."

General.

There is no need to use complicated or expensive drenches. The simple mixtures will give adequate control of parasites if used according to recommendations made here.

Before buying a drench, be certain of your objectives. You should know when you are going to use it and you should know which parasites you are dealing with.

Phenothiazine is expensive because the compounds used in its manufacture are expensive and the manufacturing process is slow and complicated. The cost of phenothiazine can be offset by its very high efficiency provided it is used at the right time It is practically the only drench which has a true preventive value, for it is effective in every sheep treated and by killing a very large proportion of the worms so reduces the contamination of pastures with worm eggs that reinfestation is reduced to a very low level.

DRENCHING AT STRATEGIC PERIODS.

Strategic and Tactical Drenching.

Strategic drenching is preventive drenching and is based on knowledge of the seasonal occurrence of infestations with the more important worm parasites. This knowledge has been gained chiefly from detailed field trials carried out at the C.S.I.R. Laboratory at Armidale, New South Wales, and from the worm survey trials carried out in Queensland by the C.S.I.R. in conjunction with the Department of Agriculture and Stock and certain graziers.

The accompanying chart (Plate 15) shows the seasonal changes in worm burdens with the three more important parasites and indicates strategic times for treatment. Strategic drenching should be carried out at the appropriate time, year in year out, no matter what the weather has been, for at any time the climatic conditions may suddenly change to favour the parasites.

Tactical drenching is aimed at preventing an increase in infestation after climatic conditions have been particularly favourable for the parasites. The worms work by the weather and drenching by the weather (tactical drenching) should forestall them. A fall of rain of 40-50 points or more accompanied by a few dull, humid days favours development and survival of the eggs and larvae of worm parasites on the ground, and sheep will begin to pick up larvae during the next few days. About three weeks later these larvae will have grown into mature worms, ready to begin laying eggs to add to the contamination of pastures. Worms younger than about 15-18 days old are more resistant to drenches than adult worms, and thus it is rather wasteful to drench until the worms are mature. Drenching about three weeks after rainy, dull weather catches the worms at a susceptible age and kills them before they can lay eggs to contaminate the pastures.

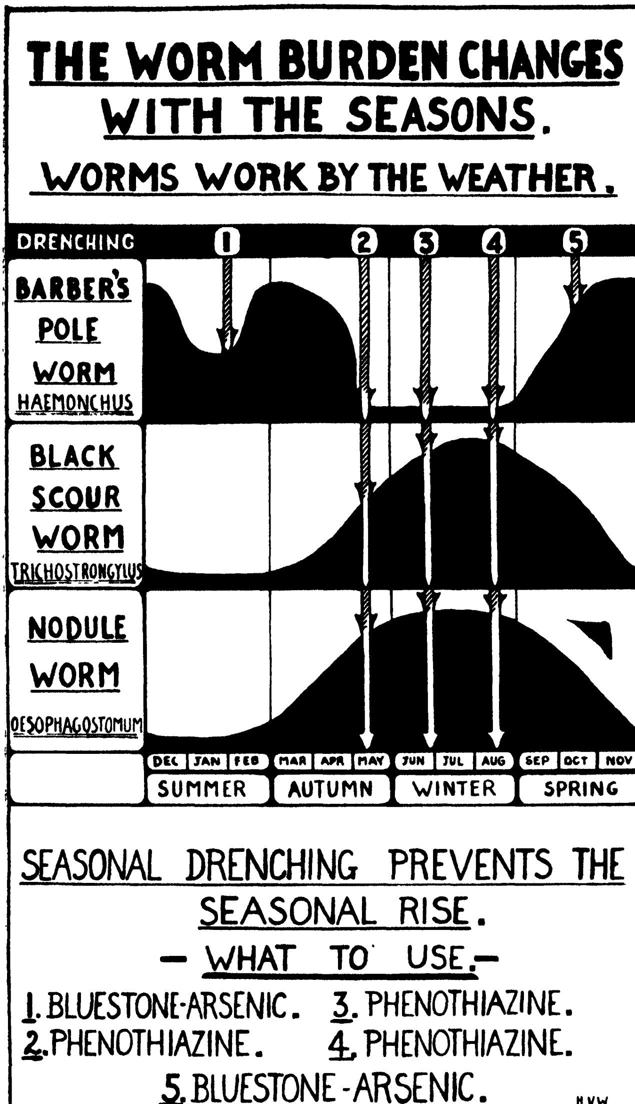


Plate 15.
STRATEGIC DRENCHING.

The nodule worm, because of its special, long drawn-out life-cycle, presents particular problems, which are discussed later.

Dryness, with heat or cold, is the greatest destructive force against eggs and larvae on pastures, and sheep are unlikely to acquire infestations during dry periods. It should be remembered, however, that sheep may carry over a previously acquired infestation into a dry period. If dry weather persists for a month or two and feed is becoming scarce it is advisable to drench. By removing the worms, which were acquired before the dry spell, the sheep will be given a better chance to thrive

under the dry conditions. It is as well to remember that in dry time sheep may overcrowd and overgraze certain local areas of green feed—for example, frontages, gullies, gilgais, &c.—and in these situations many eggs and larvae may accumulate. Whenever sheep are observed to be congregating in such situations it is advisable to drench them, whether there has been rain or not.

Large Stomach Worm or Barber's Pole Worm (*Haemonchus*).

This is a summer parasite picked up from spring through summer into early autumn. Its effects are quickly developed. Outbreaks are closely related to rainfall. A fall of 40 to 50 points or more, accompanied by dull, humid weather, will be followed by increased infestation of sheep from the pastures. By treating sheep about three weeks after such a period the developing worms will be killed before they have begun to lay eggs to contaminate the pastures further. If rains and dull weather persists over some weeks, treatment should be repeated at intervals of three weeks until the weather becomes hot and dry or cold and dry. A final treatment should be given three weeks after a period of wet weather has ended. Unless this is done, sheep are likely to carry on a heavy infestation which may later cause trouble.

Nodule Worm (*Oesophagostomum columbianum*).

This is a summer parasite depending on adequate rainfall during late spring through summer to early autumn. Larvae are picked up from pastures during the warmer months but develop slowly in the sheep and may not lead to severe ill-effects until the late autumn, winter, or even early spring months. Lack of adequate food during winter months increases the severity of the effects of this parasite. Treatments should be carried out as follows:—

(i.) Treat all sheep, and particularly breeding ewes, late in August. This will reduce contamination of pastures for spring and will protect spring lambs;

(ii.) Treat young sheep in autumn;

(iii.) Treat all sheep in winter (June–July) if infestations are severe.

(See special section on Nodule Worm, page 48.)

Small Intestinal Worm or Black Scour Worm (*Trichostrongylus*).

This is a parasite of the cooler months and is picked up in autumn, winter, and early spring. The ill-effects are usually seen in winter and are aggravated by shortages of feed. A wet autumn followed by a dry winter, and a wet winter followed by a dry or late spring, are likely to bring about severe outbreaks of black scours.

Treatment should be carried out as follows:—

(i.) Treat breeding ewes two months and one month before lambing. This is particularly important if they lamb in autumn. It reduces the chances of lambs becoming heavily infested;

(ii.) Treat lambs at weaning time whether they are thriving or not. This applies particularly to spring lambs, which are weaned in autumn, when this parasite is prevalent;

(iii.) Treat young sheep (lambs, weaners, rising two-tooth) fairly regularly (every four or five weeks) from autumn until the spring feed comes away. The wetter the season the more often should treatment be repeated; but remember that a wet autumn followed by a dry winter in especially dangerous.

A Co-ordinated Programme.

The chart illustrating the seasonal rise and fall of the three important worm parasites shows strategic times for drenching. These are not fixed for any particular date but should be carried out within a week or two of the period indicated on the chart. The timing of the late August drenching with phenothiazine is of greatest importance, for if delayed until the weather has warmed up its object may be defeated.

The drenching recommended on the chart has a number of objects:—

1. This dose of bluestone-arsenic is planned to prevent the late summer rise of large stomach worm infestation;
2. This dose of phenothiazine has several objects. It is a weaning-time treatment for spring lambs and a pre-lambing treatment for ewes to lamb in autumn. It reduces the number of nodule worms before the sheep enter the winter. It prevents a carry-over of large stomach worm into the winter. It forestalls the autumn rise of small intestinal worms;
3. This dose of phenothiazine is of greatest importance in districts where nodule worm and small intestinal worm infestations are severe. It removes nodule worms which have emerged from nodules in the bowel wall since No. 2 treatment. It is a second attack on small intestinal worms;
4. This dose of phenothiazine is probably the most important drenching in the year. It forestalls the spring rise of large stomach worm. It removes nodule worms before they begin a new season's cycle of infestation. Cold and dryness hinder the development of eggs and larvae of nodule worm on the ground with the result that during the winter little infestation is picked up by sheep. By the end of the winter most of the young nodule worms will have emerged from the nodules and will be vulnerable to drenching. This treatment late in August is the chief attack on nodule worm. It also prevents a carry-over of small intestinal worm from the winter—a very important matter if the spring and early summer are dry and do not provide the flush of feed which normally helps to remove this parasite;
5. This dose of bluestone-arsenic is a second attack against large stomach worm planned to check the spring–early summer rise of infestation.

Considerations of Husbandry.

(1) Stocking influences the occurrence of worm diseases in many ways. Overstocking results in heavy contamination of pastures with worm eggs and eventually leads to malnutrition from eating-out of the best feed. Overcrowding also leads to heavy contamination of pastures with eggs though feed may remain adequate (for example, leaving large numbers of sheep on an improved pasture for a long period). Overstocking may be local or general in a paddock or on a property. Local

effects are seen where sheep persistently regraze the same areas and neglect the rest of the paddock. The overgrazed areas soon become heavily contaminated with worm eggs and are "danger areas" for infestation of sheep grazing over them.

Overstocking or overcrowding, whether local or general, is an indication for drenching—and even more important, for reduction of stocking and spelling of areas. The dangers of local overgrazing are often overlooked.

(2) Inadequate feed reduces the resistance of sheep to worms. In addition, when feed is scarce sheep have to spend more time in grazing and have to graze closer to the ground. The chances of sheep picking up large numbers of worm larvae are thereby increased. During any period when malnutrition is evident, drenching, particularly of young sheep and breeders, should be carried out.

(3) Young sheep and very old sheep are specially susceptible to worms. Breeding ewes also suffer severely. Young sheep require regular drenching to protect them against worm infestation. Breeders should be treated before lambing in order to keep them as free from worms as possible while they have lambs at foot.

USING THE APPROPRIATE DRENCH FOR EACH PARTICULAR PARASITE.

The strategic drenching plan illustrated in the chart is based on actual observations of the annual changes in the worm burden and is an attempt to relieve the grazier from worrying whether his sheep are infested, and, if so, with which species of worms.

However, there will be occasions when a grazier wishes to know what the worm burden of his sheep may be.

The days when sheep were treated for "worms" should long be past. Different kinds of worms produce different diseases at different times of the year and require different drugs for treatment. In other words, a correct diagnosis is essential.

Diagnosis may be based on one or more of the following:—

(*a*) Recognition of symptoms;

(*b*) Examination of droppings;

(*c*) Post-mortem examination.

Recognition of Symptoms.

It is unusual to find a sheep infested by only one kind of parasite, but it is usual to find that one kind predominates and is chiefly responsible for the symptoms seen. Each parasite produces special symptoms which can usually be recognised. The more important parasites of sheep cause the following symptoms:—

(i.) *Large Stomach Worm* (*Haemonchus*).—Severe anaemia present, as shown by paleness of skin and eye membranes; "bottle-jaw" in severe cases; lack of stamina when driven; loss of condition not necessarily present—fat sheep may die; no scouring unless on lush pastures. Outbreaks generally occur from late spring to autumn;

(ii.) *Small Intestinal Worm* (*Trichostrongylus*).—Usually no anaemia; loss of condition very pronounced; scouring usual, but may not be severe if feed is dry. On green feed, typical "black scours" is seen. On dry feed droppings may not be dark in colour. Symptoms are usually seen from autumn to spring. This parasite usually affects young sheep only;

(iii.) *Nodule Worm* (*Oesophagostomum columbianum*).—Usually no anaemia; loss of condition pronounced; droppings are soft and contain slimy mucus and sometimes streaks of blood; severely affected sheep have humped backs and stiff action of hind legs; tail often held up at an angle. If nodules are present in the rectum they can be detected with the finger. Symptoms are usually seen from late autumn to early spring.

Examination of Droppings.

This is a matter for trained technicians. A single sample is of very little value. Send about ten samples from sheep which are thought to be suffering from parasites and ten from sheep in the same mob but which are thriving. Do not send mixed droppings from several sheep. Collect samples from individual sheep, either by waiting until droppings are passed by the selected sheep, or, preferably, by removing droppings from the rectum with one finger. At least a wooden matchbox full should be collected and should be dispatched at once to the Animal Health Station at Yeerongpilly.

Post-mortem Examination.

Select a sheep which is obviously affected but not one which is about to die. A sheep which has died, or is about to die, is not a good subject, because some of the worms may have died and disintegrated or have been

DESCRIPTION OF PLATE 16 (PAGE 46).

Region of Tract.	Parasites Found.
1. Gullet (Oesophagus)	..
2. Paunch or 1st Stomach (rumen) ..	..
3. Honeycomb or 2nd Stomach (reticulum)	..
4. Bible or 3rd Stomach (omasum) ..	.
5. Rennet or 4th Stomach (abomasum)..	(a) Large Stomach Worm or Barber's Pole Worm (Haemonchus) (b) Small Brown Stomach Worm (Ostertagia)
6. Small Intestine or Runners	(a) Small Intestinal Worm or Black Scour Worm (Trichostrongylus) (b) Tapeworm
7. Blind Gut (caecum)	(a) Whipworm (Trichuris)
8. Crown (Colon)	(a) Nodule Worm (Oesophagostomum columbianum)
9. Hind or Back Gut (rectum)	..
10. Caul (Omentum)	Tapeworm cysts (Cysticercus tenuicollis)

passed out. For a correct interpretation of a post-mortem examination one must know the normal location of the various parasites, their appearance, and whether the numbers found constitute a serious infestation. For example, 100 nodule worms is a serious infestation in a young sheep, whereas the same number of large stomach worms or small intestinal worms would be harmless to their host.

Plate 16.

DIGESTIVE TRACT OF SHEEP SHOWING LOCATION OF WORM PARASITES.

Always consider the state of nutrition in connection with worm infestation: the poorer the feed the fewer worms are necessary to cause disease. Where graziers are not familiar with the anatomy of the sheep and the appearance of the parasites it is best to send the whole of the digestive tract, excepting the paunch but including the liver and lungs, to the laboratory. The material must be packed in 5 per cent. formalin in a sealed tin. Unless preserved, the worms distintegrate rapidly.

The appearance of the digestive tract of the sheep and the location of the various worm parasites is shown in Plate 16.

Importance of a Correct Diagnosis.

It is essential that consideration be given to all the factors which might influence the condition of the sheep before arriving at a final diagnosis. Cases are known where sheep suffering from "fluorosis," a disease in which the teeth wear unevenly at an early age, have exhibited symptoms similar to worm infestation. When conducting post mortems, be careful to look at the condition of the back teeth.

METHODS OF CONTROL OTHER THAN DRENCHING.

An attack against worm parasites should be concentrated along three main lines:—(1) killing the worms in the sheep by drenching; (2) killing the eggs and larvae on the ground by allowing sunlight, dryness, and cold to destroy them while the area is spelled from sheep; (3) maintaining the general health and resistance of sheep by means of adequate nutrition.

Why Outbreaks Occur.

In the better rainfall areas practically all sheep harbour worms, yet severe outbreaks of parasitic diseases are relatively uncommon. Disease depends on the number of worms present and the damage they cause. Every worm in a sheep is picked up as a larvae on the pasture; every larva comes from an egg laid by a worm in a sheep. For their development and survival on the ground eggs and larvae must have warmth, moisture, and shelter. Several wet days accompanied by cloudy and humid conditions are necessary. Under very favourable conditions eggs and larvae may live on the ground for many months, but under average conditions a very high proportion of them dies off within three or four weeks.

Spelling and Rotational Grazing.

If sheep are drenched and returned to the same paddock they will begin to pick up infective larvae as soon as they begin to graze, and in a few weeks may be just as heavily infested as before drenching. By moving the sheep to a paddock which has been spelled for three weeks reinfestation is greatly reduced. A system of rotational grazing provides spelled paddocks at all times.

Spelling a paddock for three to four weeks results in the death of most of the worm larvae and this very greatly reduces the risk of heavy infection when sheep are again placed in it. Spelling also permits pasture growth and provides better nutritional conditions. Adequate nutrition builds up and maintains resistance to worms. Spelling is always worth while as a control measure.

Rotational grazing and spelling can be combined conveniently. If there are two paddocks of about equal size, carrying approximately

the same number of sheep, run all of the sheep in one paddock for three to four weeks, then transfer them all to the other paddock which has been spelled meanwhile. Repeat this rotation and spelling.

An even more intensive system can be used under suitable conditions. A four-paddock unit can be used and each paddock stocked in turn for seven days with all the sheep which formerly ran over the whole area of the four paddocks. Each paddock is thus stocked for seven days and spelled for 21 days. In general, a period of about seven days is necessary for the eggs passed in droppings to develop through several stages to that of the infective larvae. By moving sheep every seven days the sheep are ahead of the worms and this together with the 21-day spell should still further reduce the chances of reinfestation.

Rate of Stocking.

Reduction of stocking aids the control of worms by reducing contamination of pastures and making more feed available. Many graziers have found that a reduction of sheep numbers has not resulted in a lower wool cheque but in an actual increase in wool and monetary returns. If the whole property cannot have the stocking rate reduced, reduce the numbers of breeders and young sheep, or else give them more room.

Protecting Young Sheep.

Weaners are most susceptible to worms, and they are often crowded at a relatively high rate of stocking because they are small sheep. Their demands for certain food materials are greater than those for grown sheep—weaners are expected to grow as well as to produce wool, whereas the grown sheep has only to maintain itself and produce wool. Weaners should at all times be provided with adequate feed. The weaner population of a paddock should be kept low. This can be achieved by "cross-weaning" or weaning into a wether mob. If a property is "sheep-to-the-acre" country, aim to have half a weaner and half a grown sheep per acre rather than one weaner per acre. Grown sheep are resistant to worms and do not contaminate pastures heavily. Moreover, they probably destroy many of the larvae which they eat with their feed, whereas the same larvae eaten by a weaner, which is not resistant, will develop into adult worms.

Adequate Nutrition.

Adequate nutrition is of very great value in the control of worms. A well-fed sheep develops and maintains resistance to worms. Grazing crops, improved pastures, spelled pastures, rotational grazing, and conserved feed are all means for maintaining adequate nutrition, and they all diminish the need for drenching.

CONTROL OF THE NODULE WORM.

Special consideration is given to the nodule worm because of its importance as a cause of economic loss to the sheep and wool industry and because of special difficulties in devising methods of control. The distribution of this parasite is shown in Plate 18.

After having been picked up from the grass by the grazing sheep the larval stage of the nodule worm burrows into the wall of both the small and large bowel. Generally, a nodule, like a small abscess, develops and once formed may remain in the bowel throughout the

life of the sheep. The number of nodules is increased every year with the result that more and more of the bowel is affected. In a number of sheep the amount of damage due to nodules is sufficient to interfere with the functions of the bowel. Many sheep properties where nodule worm occurs carry uneconomical animals because of this damage.

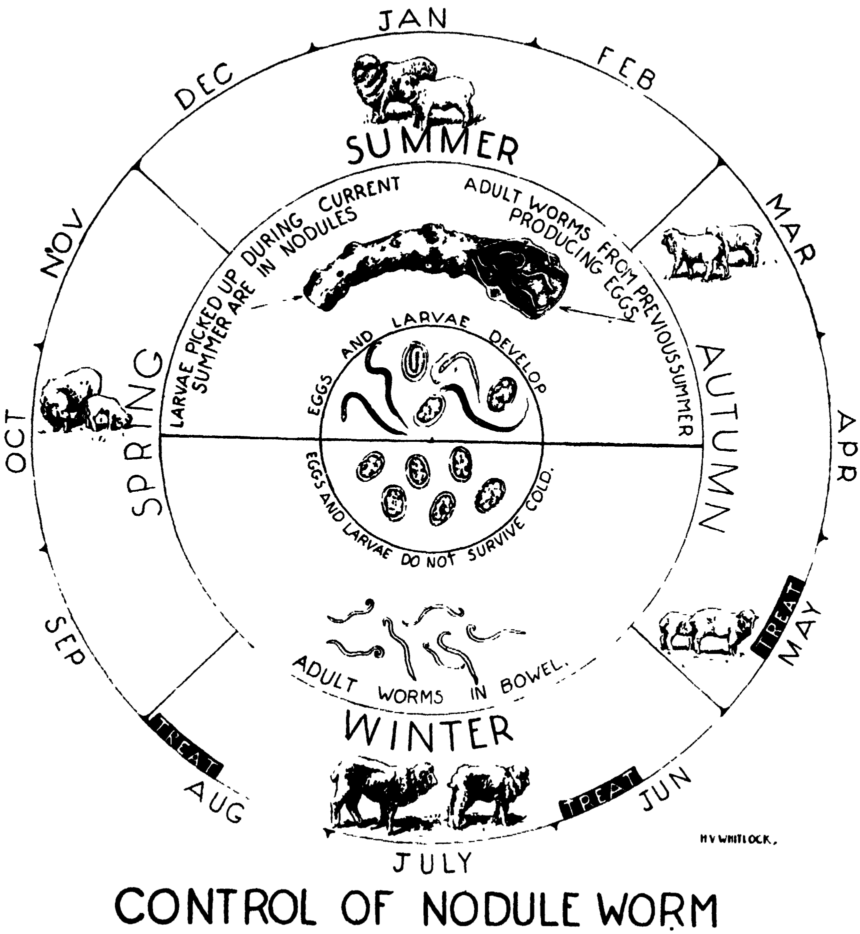


Plate 17.

CONTROL OF NODULE WORM.

It is clear that complete control of this parasite will be a matter of several years, for it will not be reduced to negligible importance until all sheep having nodule damage to the bowel are disposed of and replacements have been raised under a control plan.

Control is a matter of killing the adult worms in the large bowel by drenching with phenothiazine at certain times based on knowledge of the life history of the parasite and of the effects of weather and seasonal conditions on its yearly cycle. Plate 17 illustrates some of these points.

The eggs and larvae of the nodule worm on the ground will develop only when there is ample warmth and moisture. Dryness and cold are fatal. The sheep pick up the infective larvae following periods of wet weather during the warmer months of the year, chiefly September to May. The larvae enter the bowel wall and may remain there for a few days, weeks, or even months before returning into the bowel to complete development to adult worms and begin laying eggs to carry on the life-cycle. Larvae in nodules in the bowel wall cannot be killed by drenching. Drenching must therefore be repeated in order to kill the adult worms developing from successive batches of larvae leaving the bowel wall.

The onset of cold weather in May and June largely prevents further development of eggs and larvae on the ground, with the result that very little fresh infestation is picked up by the sheep after the end of May. By the end of August most of the larvae will have completed their sojourn in the bowel wall and will have returned to the large intestine.

With the onset of warmer weather in September the eggs laid by the female worms will be able to develop on the ground and thereby begin the new seasonal cycle of the parasite. Drenching late in August therefore has two objectives—firstly to obtain a maximum destruction of adult worms at a period when there is likely to be a minimum number of larval stages in the bowel wall, and secondly to kill the worms before they have a chance to bring about contamination of spring pastures.

The August treatment of ewes which are to lamb in spring is essential if the lambs are to be protected.

Although the nodule worm is acquired by sheep during the warmer months, it produces its most serious ill-effects during the winter due to the damage caused by the young worms in the bowel wall and the injury caused by the adult worms.

Malnutrition in the winter is aggravated by infestation with nodule worms. A very important aspect of control of this parasite is the provision of adequate feed during the winter. A green grazing crop is particularly useful.

A plan of control should be based on the use of an efficient drench applied at the appropriate times having due regard to the seasonal cycle of the parasite. Phenothiazine is the only drench possessing a high degree of efficiency against the nodule worm. The times for drenching are shown in Plates 15 and 17. The late autumn treatment will remove adult worms already present in the large bowel and will thereby provide the sheep with a better start for the winter. The mid-winter drench is necessary in districts where nodule worms are causing severe ill-effects. The special importance of the late August drench has been discussed already.

Regular treatments along these lines will, after two or three years, go far towards reducing the nodule worm to harmless levels. The control programme can be hastened and made more effective by adopting certain changes in management.

The more important procedures are, where possible, provision of green grazing crops to supplement winter feed, and the adoption of a system of spelling and rotational grazing so that following the three

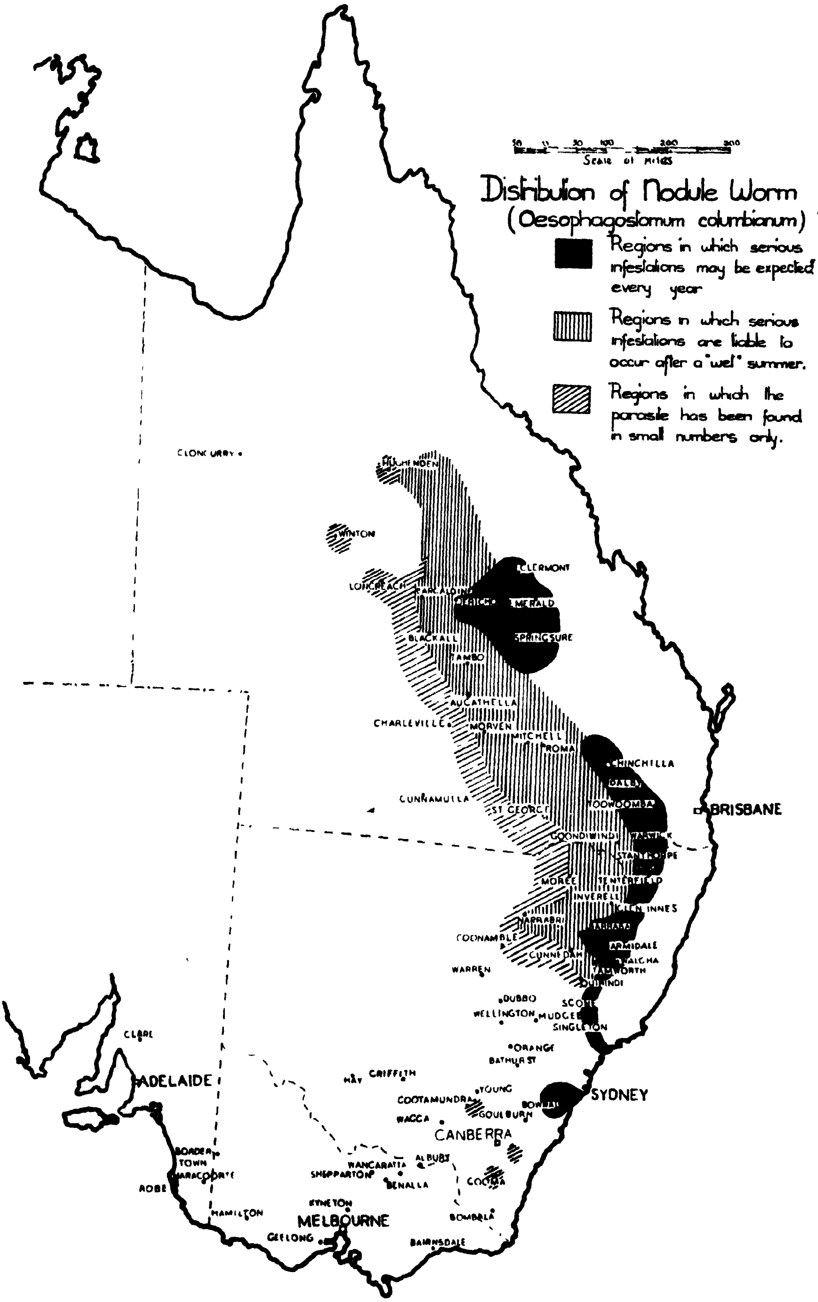


Plate 18.
DISTRIBUTION OF NODULE WORM.

key drenchings the treated sheep can be moved into paddocks which have been spelled from sheep for a month. (Horses and cattle, which do not harbour the sheep nodule worm, can remain in such paddocks while being spelled from sheep.)

A simple system of rotational grazing and spelling is described on page 47.

WORMS IN THE WEST—WORMS AND DROUGHT.

The regional occurrence of worm parasites is controlled chiefly by weather conditions, particularly rainfall. The eggs and larvae on the ground must have moisture for their development and survival. The building up of heavy infestations depends to a great extent on the rate of stocking. The lighter the stocking the smaller the chances of a sheep picking up worm larvae.

In the far west weather conditions and the low rate of stocking keep the worm burden very light. The effects of exposure on eggs and larvae account for differences in the occurrence of worm infestation between open downs country and scrub country.

Worms do occur in the west, usually in very small numbers. Special conditions are required before the parasites are enabled to increase to dangerous levels.

A series of unusual seasons—for example, two or three "wet" seasons in succession—may be followed by outbreaks of worm infestation. Usually it is the large stomach worm which causes trouble, for this parasite, because of its very high rate of egg production (5,000 per female per day), is able to multiply more rapidly than the others. A single "wet" season is generally insufficient, for when the parasites have to begin from the very small numbers which usually occur in the west it takes some time to build up heavy infestations.

Overcrowding of sheep is likely to result in a building up of infestations. In the areas of low stocking such overcrowding is generally of a local nature; for example, sheep crowding on areas of fresh feed on frontages, in gilgais, and on watercourses, or congregating round watering places. Any situation which is overcrowded and thereby heavily contaminated with droppings and the accompanying worm eggs is a "danger area." When a "danger area" is protected by shade or by being located in a low-lying place, the worm eggs and larvae will find suitable conditions for development and survival and the high rate of stocking on the area will lead to building up of the worm burden of the sheep.

Recognition of these two important features:—(1) a series of "wet" seasons and (2) local overcrowding, will enable the application of appropriate control measures in good time before the worms have caused trouble.

Where do the worms go in the dry times? Without moisture and shelter the eggs and larvae on the ground soon die, but the worms in the sheep host live on for months, even for a year or more, and they keep on laying eggs. The sheep is the reservoir of infection.

In regions which have suffered severe drought the sheep which survive will be in very low condition, and they will have practically no resistance to worm infestation. If good drought-breaking rains come, and feed begins to grow quickly, the sheep will recover quickly too,

and will soon overcome any worm parasites which may have established themselves. However, if the rains are not sufficient to bring a rapid growth of good feed, the sheep will not recover quickly, and may not resist worms picked up as a result of the wet weather.

Even under drought conditions there are certain places which may be dangerous from the point of view of worm infestation. Any place where sheep are crowded together, and which provides shelter and moisture from worm eggs and larvae in droppings, is dangerous. Watering places, feeding grounds (if sheep are being fed on the ground), feeding troughs and camps, may all have actual or potential dangers. Board troughs with earth bottoms can be very dangerous. but if they are situated in open sunlight probably very few larvae will develop in the droppings which collect in and around them. When bag troughs sag and make contact with the ground, droppings can bank up underneath in a sheltered situation which may permit larvae to develop. Such larvae could then crawl through the sacking into the feed.

Feeding grounds are specially dangerous when rain comes, and it is wise to move to a new area after any fall of rain sufficient to wet the soil for an inch or so.

In drought time when the nutrition of the sheep has suffered, there will be less resistance to the effects of worms. A degree of infestation, which in normal times would not be of much consequence, may in drought time be very important. It is, therefore a wise precaution to drench sheep as soon as it is evident that they are losing condition because of a shortage of feed.

SUMMARY.

Drenching is expensive and is an attack on only half of the problem of control of worm parasites.

Prevention of outbreaks by strategic drenching and management is the aim of control measures.

If the sheep is well fed all the time and treated with the right drench at the right time parasites will not cause losses.

Phenothiazine has provided a new outlook on control of parasites because it has tremendous "preventive" value, but it should not be used indiscriminately; other and cheaper drenches are still effective in their proper time and place.

The Large Stomach Worm.

1. The large stomach worm is a summer parasite most prevalent in spring, summer, and early autumn.

2. Risk of infection is increased by a fall of 40-50 points of rain followed by some days of dull, humid weather.

3. Treat sheep about three weeks after such periods, and if dull, rainy weather persist for some weeks, repeat treatments at three-week intervals until dry or cold weather returns.

The Nodule Worm.

1. Infestation is picked up in spring, summer, and early autumn, but effects may not be seen until winter.

2. Treat breeding ewes late in August. This will reduce risk of spring lambs becoming infested.

3. Treat young sheep in autumn to prevent disease in early winter.

4. Treat all sheep in winter (June-July).

5. Use Phenothiazine.

The Small Intestinal Worm.

1. This is a parasite of the cooler months, and infection occurs in late autumn, winter, or early spring.

2. Severe infections occur after a wet autumn, followed by a dry winter, or a wet winter followed by a dry spring.

3. Treat lambs at weaning time, whether thriving or not, particularly spring lambs weaned in the autumn.

4. Treat young sheep at four to five-week intervals from autumn until spring feed comes away, particularly when winter is either dry or very wet.

5. Treat ewes two months and one month before lambing is due. This will reduce infection of the lambs.

Management of Stock to Prevent Outbreaks of Severe Worm Infestation.

1. Overstocking leads to heavy contamination of pastures with worm eggs.

2. Overstocking may be general over the whole paddock, or may be localised—for example, in gullies, frontages, &c., when the remainder of the paddock is bare or dry.

3. Guard against general overstocking by keeping numbers down, especially young sheep and breeders.

4. Look for evidence of local overstocking, and when observed drench the sheep.

5. Risk of infection may be reduced by rotational grazing and spelling of paddocks.

6. Where there are two paddocks of about the same size, carrying about the same number of sheep, run all the sheep in one paddock for three or four weeks, then move them all to the other paddock which has been spelled meanwhile.

7. This can be repeated; it can become the usual method of stocking. It is the simplest method of providing spelled paddocks.

General.

1. Drench ewes before lambing, and young sheep whenever conditions as outlined above are likely to expose them to risk of infection.

2. Find out which kinds of worms are responsible for trouble and use the appropriate drench.

3. Your sheep and wool adviser, stock inspector, or district veterinary officer will help you—consult him.

MARKETING

Production Trends—June.

Throughout the dairying districts splendid rains were received during June. Pastures generally are in good condition, and the dairying industry seems assured of one of the best winter seasons for many years. During the past year butter and cheese production in Queensland show a substantial increase on production for the previous year. The following table shows total production for the year, July to June, 1946-47, in comparison with the estimated total production for the year, July to June, 1947-48.

Year.	Butter.	Cheese.
	tons.	tons.
1946-47	33,079	7,719
1947-48	46,246	9,651

On the Darling Downs sowing of the wheat crop is now nearing completion. It is expected that the total area sown will be approximately 15 per cent. in excess of that for the previous season, and will reach at least 550,000 acres. Barley and oat crops are making good growth. The acreage of barley planted is estimated to be 12,000 to 15,000 acres.

Harvesting of the maize crop throughout Queensland is well under way. Total State production will be considerably less than normal, and may approximate 2,000,000 bushels.

Harvesting of the grain sorghum crop is still in progress in some districts. Total production for the State is estimated at 850,000 bushels.

In the peanut-growing areas harvesting of the crop is in progress. Estimates of production have been difficult in all districts owing to damage caused by rain and mice, and variable reports have been received. It seems, however, that the State production will not reach 20,000 tons, and may possibly be down to 16,000-18,000 tons.

During June the dry conditions experienced throughout the northern and north-western pastoral areas of the State showed no abatement, and stock are being removed wherever practicable for agistment purposes. Unless relief rains are forthcoming at an early date, stock losses are expected to increase considerably in such areas. Elsewhere stock are in good condition, and feed and water supplies are ample for the time being at least.

The Tobacco Leaf Marketing Board.

An Order in Council has been issued under the *Primary Producers' Organisation and Marketing Acts* constituting a marketing board for tobacco leaf produced in Queensland for a period of three years from 22nd July, 1948.

The Board consists of four growers' representatives, namely, Messrs. T. V. Gilmore (Mareeba), E. H. Short (Dimbulah), J. P. Power (South Brisbane), and R. Ziviani (Inglewood), together with the Director of Marketing.

Messrs. Gilmore and Short were elected unopposed for District No. 1, comprising all that part of Queensland lying north of the Tropic of Capricorn, whilst Messrs. Power and Ziviani were the successful candidates at the election for District No. 2, comprising all that part of the State lying south of the Tropic.

It is expected that the Tobacco Leaf Marketing Board will assume its marketing functions after the termination of the present Commonwealth-wide scheme of marketing under the National Security (Australian Tobacco Leaf) Regulations on 31st December next.

The Potato Marketing Board.

The Queensland Potato Marketing Board at its meeting held on 8th July, 1948, dealt extensively with matters of administration which will be given effect to in the near future.

Applications are being called for the position of Manager of the Board, and an early appointment will be made to enable the Board to take control of the marketing of the spring crop without any hitch. With the ceasing of control the contract system will disappear, and in future any producer may plant potatoes and will be required to deliver crops to the Board for marketing. This also applies to intending new growers. The duties of the new appointee will be to make an immediate survey of the crop position and despatch a query to all growers relative to their probable acreage during the next harvest.

Publicity will be given to the Board's requirements in this respect so that new growers may contact the Board in order to supply fully any information required.

CURRENT FEEDING VALUES FOR MONTH OF JUNE, 1948.

(Division of Animal Industry and Division of Marketing.)

Feed.	Starch Equivalent Value per 100lb.	Protein Value per 100lb.	Average Wholesale Selling Price at Brisbane.	Cost per Starch Equivalent Unit.	Remarks
				d.	
			STARCH CONCENTRATES.		
Wheat	72	8	7s. 7d. bushel	2·11	Light supplies sorghum were available early in the month. Deliveries have fallen off considerably
Wheat meal ..	72	8	£14 13s. 4d. short ton	2·44	
Maize	78	8	7s. 7½d. bushel	2·09	
Maize meal ..	71	8	£15 0s. 0d. short ton	2·53	
Sorghum ..	71	7	£12 15s. 0d. ton	1·92	
Sorghum meal ..	71	7	£13 0s. 0d. short ton	2·19	
Barley .. .	71	7	Not quoted		
Barley meal ..	71	7	Not quoted		
Oats	62	8	5s. 9d. bushel	2·78	
Crushed oats ..	62	8	5s. 11d. bushel	2·87	
Pollard	66	10	Not quoted		
Bran	56	10	Not quoted		
Molasses ..	50	1	47s. 6d. 44-gal. drum	2·59	
			PROTEIN CONCENTRATES.		
Meat meal ..	80	55	Not available		
Linseed meal ..	72	25	Not available		
Peanut meal ..	78	43	Not available		
Blood meal ..	63	68	Not available		
Cottonseed meal	67	33	Not available		
			ROUGHAGES.		
Lucerne hay and chaff	40	10	Hay £7 15s. 0d. ton Chaff £11 15s. 0d. ton	2·07 3·14	Wheaten chaff is in very light supply
Oaten hay ..	33	3	£9 0s. 0d. ton	2·92	
Wheaten hay ..	33	3	Not available		
Oaten chaff ..	40	3	£10 10s. 0d. ton	2·81	
Wheaten chaff ..	40	3	£7 5s. 0d. ton	1·94	
			MINERAL SUPPLEMENTS.		
Ground calcium carbonate (limestone)			Not quoted		
Bone meal			£11 0s. 0d. ton	(11s. 2d. per 100 lb.)	
Bone flour			Not quoted		
Shell grit (dicalcic phosphate) ..			4s. 0d. bag		

GADGETS AND WRINKLES

A DIBBER ON WHEELS.

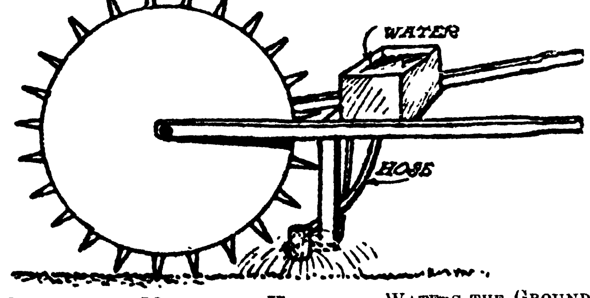
The owner of a gardening business says that he has had to transplant many small plants every year. For days he has worked on his knees making holes for them with a hand dibber. He has grown acres of celery, and at first he knew no better way than to make the holes, then, if setting in a dry time, to pour in water by hand. It occurred to him when pressing the dibber into the soil that if the dibber were on the outside of a weighted wheel with handles like a wheelbarrow, it could drive the dibbers into the soil as effectively as by hand. He made some experiments and found that the idea worked out as he had expected.

A wheel about two feet in diameter was made of boards, with holes bored around the outside about six inches apart, and with pegs made of hardwood driven in the holes so as to extend four inches from the outside of the wheel. The wheel was three inches thick, which left room for two bands of hoopiron around the outside of the wheel with the pegs or dibbers in the middle between them.

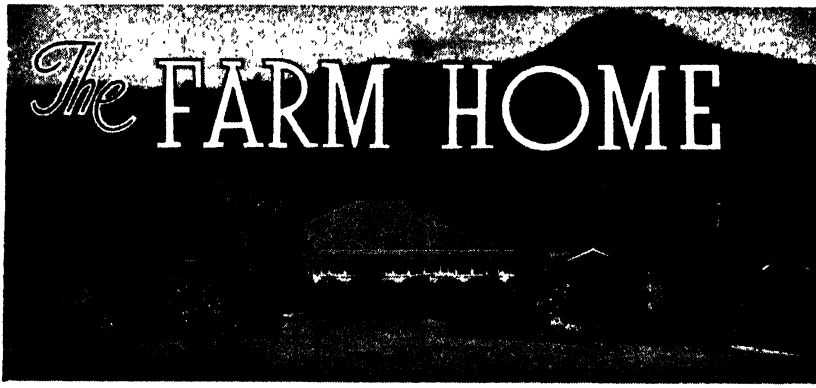
He still had to apply the water by hand, however, and as the wheel needed more weight the idea came to him to make a water-tight box, place it on the handles of his wheel and carry the water with a piece of hose to carry the water down. To prevent washing the ground and filling the holes, the hose emptied into a small tin can perforated at the bottom, so that the water fell gently to the ground like rain This can was attached to a piece of wood fastened to the handles and extending down to about two inches from the ground. A water tap in the box regulated the amount of water in the hose.

This simple and cheaply made device was so satisfactory that, with the help of a carpenter, he made a machine with two wheels that looked like a push cart. The plan was about the same, but it did double the work. This machine marked the ground, made holes for plants, and put the water in them as fast as it was drawn over the ground. He sometimes used water with a solution of fertilizer in it.

This machinery was used very effectively for transplanting many acres of celery, and worked equally well for all small plants, as onion sets or bulbs of any kind, lettuce, small cabbage plants or any plant that required planting at regular distances apart.



A DIBBER THAT MAKES THE HOLES AND WATERS THE GROUND.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

WHAT CAN BE DONE FOR THE HANDICAPPED BABY.

Most Babies are Normal.

HAVE you ever thought how wonderful it is that out of the thousands of babies born every year in every country in the world the great majority are physically and mentally perfect. The complicated organism that is a human being usually comes into the world with every organ and sense in absolute working order.

But just occasionally—because, probably, of some maternal condition which retards or arrests the baby's development before birth—there is a flaw somewhere. Maybe just a small one—a slightly twisted foot, "hammer toes," weakness of heart action or sight or hearing, which may set the child back as he grows older. Some babies take a longer time than usual in learning to do things or notice things.

If a mother is attending a maternal and child welfare centre the sisters, who handle thousands of babies every year, will quickly recognize any defect and advise her where she can go to have it attended to.

For the benefit of mothers who are unable to attend a centre or have their babies examined by a doctor, the average progress of development is outlined.

What Should a Baby's Progress be.

Lest any mother be needlessly anxious about the progress of her baby, it is well to understand that children differ in regard to the ages at which they reach the various stages of development. On an average, most babies are able to hold up their heads about the age of three months, and at about six months they are learning to sit up; although they may be eight or nine months old before they can sit without some support, particularly if they are big fat babies. By the ninth or tenth month, most babies can crawl and by eleven or twelve months can stand by holding on to a chair or the side of the play pen. Between twelve and fifteen months they learn to walk alone.

In regard to both cutting teeth and talking there is considerable variation in the rate of development. The first tooth may be cut at six or seven months, and six teeth may be present at twelve months. The cutting of the first tooth may be delayed until nine months or later, and then be quickly followed by the others.

A baby may utter single syllables at the age of nine months and single words at twelve months. A few are slow in learning to speak, although mothers notice that they can understand quite well what is said to them.

Deformities or Delayed Development.

It is *most important* that these should be recognized early so that the cause may be investigated. Parents *should realise their responsibility* in this regard. The treatment of bony defects or deformities should be carried out quite soon after the baby is born and while the bones are soft and pliable; when this is done they can usually be corrected completely. Even serious deformities can be helped considerably by doctors who specialize in this branch of medical science. It is cruel to allow a child to be handicapped all his life for the want of early attention to his defect or deformity. If specialist attention is needed and country parents are unable to afford the expense of coming to Brisbane for it, *The Maternal and Child Welfare Service* may be approached and the circumstances stated.

Even the mentally handicapped child may be assisted towards a more satisfactory life if the parents obtain specialist advice while he is young. Parents should never allow a child a remain untreated because they think "poor baby is crippled or not normal and it cannot be helped." *The Maternal and Child Welfare Service* was established to help every parent with every baby and child up to school age. Something can be done for every child normal or otherwise. Call or write with your problem giving full particulars.

Any further advice on this and other matters connected with children may be obtained by communicating personally with *The Maternal and Child Welfare Information Bureau,* 184 *St. Paul's Terrace, Brisbane,* or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

Recipes Worth Trying.

Danish Tripe.

Take a piece of tripe large enough to fold over. Make a stuffing of onions, a little sage, bread crumbs, salt and pepper. Put a thick layer of this on the tripe. Fold together so that the stuffing will not be lost and sew together with string. Put in a greased baking dish. Cover with several slices of butter, dripping would do, cover with a buttered paper and bake slowly for about an hour.

When cooked make a brown gravy of the juice in the pan and serve over the tripe. Parsley and mashed potatoes could be served with it.

Savoury Patties from the Oven.

Ingredients: About 3 oz. cooked meat scraps, three rashers of bacon (or any ham or pork scraps), quarter loaf stale wholemeal bread soaked in a little milk or water, and then pressed dry; one cup cold mashed potatoes, one dessertspoon chopped parsley, a pinch of fresh thyme or marjoram, one dessertspoon tomato sauce or ketchup, salt and pepper to taste.

Mince the pieces of meat and bacon, and then mix all ingredients thoroughly together, moistening with a little milk if necessary, or with a beaten egg. The mixture should be stiff enough to hold together in little individual patties. Form these into rissole shapes, place in meat dish, and bake with a little dripping in a fairly hot oven for about 20 minutes. Serve with gravy and vegetables.

Minty Potato Soup.

Ingredients: 1 oz. fat, finely sliced onion, 1½ lb. potatoes, 2 pints stock, ½ to ¾ pint milk (optional), 1 teaspoon cornflour, salt and pepper, 1 to 2 level tablespoons freshly chopped mint.

Melt the fat in a saucepan and fry onion gently for a few minutes without browning. Prepare and slice potatoes, add to pan and continue frying for a few minutes longer. Add the two pints of liquid and a little seasoning and cook gently for about ¾ hour. Rub all through a sieve, or mash well together and return to pan. Mix the cornflour smoothly with a little cold water, stir into the soup and simmer for a few minutes, stirring all the time. Add the milk, if used, and thin soup down with a little hot liquid if necessary. Adjust seasoning, make quite hot and sprinkle in the mint.

QUEENSLAND WEATHER IN JUNE.

During the month the South Coast, Darling Downs and Maranoa Divisions all recorded above average rainfalls, which supplemented the excellent falls received in these areas during May. The Warrego and Far South-West Divisions also received above normal totals, which should supplement rains in the early months of the year and ensure adequate winter feed for pastoralists. In all other divisions, with the exception of the North Coast Barron, general rainfall distribution was below normal, although in parts of the Central Highlands and Lowlands above average totals were registered at many places, this being the first useful rain since March. However, whilst these rains will provide some immediate relief in these latter areas, further rain will be required in the near future in order to consolidate any benefits received. In other inland areas, viz. the Carpentaria and Western Divisions and parts of the Central Lowlands, the dry spell continues and prospects are not good for the coming colder portion of the winter period.

The main contribution to the over average rainfall distribution in the above-mentioned areas occurred chiefly in the rain spell from the 14th to 16th, during which period the following regions received the amounts indicated:—Maranoa and Western Darling Downs 1½ to 2 inches; South Coast Port Curtis and northern portion of South Coast Moreton 2 to 4 inches; eastern Darling Downs and southern portion of South Coast Moreton 6 to 16 inches. The remainder of the month's rainfall occurred in the southern border divisions and coastal divisions from 7th to 12th and 22nd to 23rd, when scattered light to moderate falls were registered.

Floods.—As a result of the rain spell from the 14th to 16th, many places in the South Coast, Moreton and eastern Darling Downs Divisions received heavy to local flood fall amounts. The heaviest aggregates for the period were Springbrook 1,659, Nerang 1,382, Coolangatta 1,255, Southport 1,252, Tallebudgera 1,175, and Mount Tamborine 1,133 points. The heaviest 24 hourly totals were reported on 15th from Nerang 1,137, Mount Tamborine 907, Tallebudgera 890, Southport 864, and Sandgate 825. Low level flooding occurred in the coastal area south from Brisbane to the border, along the catchments of the Mary, Pine, Brisbane, Logan, Coomera and Nerang Rivers, and resulted in considerable damage to crops, roads, communication systems, premises and in suspension of road and rail transport. Some wheat plantings were affected on the Darling Downs and in a few cases these were a total loss. In the Downs area local flooding also was reported along the Condamine River basin. Millmerran was isolated until after 18th and traffic approaches to Dalby were also cut off. The lower reaches of the Condamine River were still carrying considerable run off and rising slowly at the end of the month. Flooding was heaviest in the South Coast border areas adjacent to the northern rivers districts of New South Wales where damage was estimated to exceed £250,000.

Temperature.—Maximum temperatures were slightly above normal in the Peninsula and all inland areas, except in Maranoa and Far South-West Divisions. The coastal areas recorded below average reading. Cloncurry 0.7 deg. above normal and Palmerville 0.8 deg. above normal had the highest averages, while Cairns 2.2 deg. below normal and Thargomindah 1.7 deg. below had the lowest average. Maximum temperatures were above normal in the Georgetown, Cairns, Longreach, Thargomindah, and Mitchell areas, but below normal in other districts ranging from 2.1 deg. above at Longreach to 3.3 deg. below at Camooweal. Due to the persistent tropical dip influences during the month, frost activity was not as frequent or as heavy as they were during May, and occurred principally during the early and latter parts of the month. The centres in which most frosts occurred were.— Stanthorpe 14 nights (21 deg. screen and 12 deg. grass 29th); Kingaroy 13 nights (25 deg screen and 17 deg. grass on 29th and 30th); Toowoomba 11 nights (27 deg. screen, 17 deg. grass on 29th).

The rain position is summarised below:—

Divisions	Normal Mean.	Mean June, 1948.	Departure from Normal
	Points.	Points.	Per. Cent
Peninsula North	58	16	72 below
Peninsula South	45	3	93 ,,
Lower Carpentaria	51	4	92 ,,
Upper Carpentaria	83	22	73 ,,
North Coast, Barron	205	255	24 above
North Coast, Herbert	285	234	18 below
Central Coast, East	197	119	40 ,,
Central Coast, West	130	29	78 ,,
Central Highlands..	159	158	1 ,,
Central Lowlands ..	117	86	26 ,,
Upper Western	67	9	7 ,,
Lower Western	73	20	73 ,,
South Coast, Port Curtis	251	297	18 above
South Coast, Moreton	297	797	168 ,,
Darling Downs, East	183	589	222 ,,
Darling Downs, West	159	353	122 ,,
Maranoa	158	236	49 ,,
Warrego	134	187	39 ,,
Far South-West	101	118	17 ,,

Commonwealth of Australia, Meteorological Bureau, Brisbane.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JUNE RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall. June.	Average Rainfall. No. of years' records.	Total Rainfall. June, 1947.	Total Rainfall. June, 1948.
North Coast.	In.		In.	In.
Atherton	1·73	42	2·45	3·25
Cairns	2·89	61	3·76	4·06
Cardwell	2·09	71	1·38	2·24
Cooktown	2·06	67	2·14	1·65
Herberton	1·18	57	1·42	1·94
Ingham	2·16	51	1 66	3·12
Innisfail	7·41	62	8·71	6·02
Mossman	2·97	19	4·82	3·23
Townsville	1·38	72	0·17	0·11
Central Coast.				
Ayr	1·48	56	0 16	0·26
Bowen	1·64	72	0·24	1·24
Charters Towers	1·31	61	0·09	0·25
Mackay	2·74	72	1.03	2·51
Proserpine	3·22	40	1·03	2·43
St. Lawrence	2·46	72	0 02	1·73
Central Highlands				
Clermont	1·68	72	0·00	0·53
Springsure	1 76	74	0.00	1·52
South Coast.				
Biggenden	2·16	44	0·20	2 33
Bundaberg	2·79	60	0·20	4·67
Brisbane Bureau	2·54	96	0·29	8 83
South Coast—contd.	In.		In.	In
Caboolture	2·74	67	0·27	5·85
Childers	2·40	48	0 17	5·44
Crohamhurst	4·29	50	0·37	8·70
Esk	2·14	56	0 11	3 41
Gatton College	1·72	41	0 63	..
Gayndah	1·82	72	0·03	2·91
Gympie	2·60	73	0·56	5·13
Kilkivan	2·14	62	0 42	3·39
Maryborough	2·93	72	0·29	5·21
Nambour	5 69	47	0·31	5·86
Nanango	1·95	61	0·44	2·45
Rockhampton	2·51	72	0·07	1·92
Woodford	2·78	55	0 33	5·74
Darling Downs				
Dalby	1·63	73	0·90	3·42
Emu Vale	1·45	47	0·44	6·72
Jimbour	1·53	84	0 64	2·69
Miles	1·69	58	0·20	3·84
Stanthorpe	1·88	70	0·67	7·53
Toowoomba	2·33	71	0 91	7·13
Warwick	1·70	78	0·58	6 43
Maranoa.				
Roma	1·46	69	0 25	1·80
St. George	1 46	62	0 46	2·87

CLIMATOLOGICAL DATA FOR JUNE.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature. Mean Max.	Shade Temperature. Mean Min.	Extremes of Shade Temperature. Max.	Extremes of Shade Temperature. Date	Extremes of Shade Temperature. Min.	Extremes of Shade Temperature. Date.	Rainfall. Total.	Rainfall. Wet Days
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	77	64	80	6, 8, 21	53	19	406	15
Herberton	..	69	51	78	20	37	24	194	14
Townsville	..	78	58	82	22	49	29	11	1
Rockhampton	30·11	74	53	80	22	41	29	192	5
Brisbane	30·18	69	51	77	20	42	29	883	10
Darling Downs.									
Dalby	..	67	43	75	21	26	28, 29, 30	342	5
Stanthorpe	..	61	37	68	11, 12	21	29	753	9
Toowoomba	..	62	43	70	2, 20	27	29	713	9
Mid-Interior.									
Georgetown		82	56	86	3, 6, 8, 9, 20			3	1
Longreach	30·19	75	49	86	21	37	30	81	1
Mitchell	30·19	66	41	78	20	26	28	220	4
Western.									
Burketown		83	55	88	4, 20, 22	43	29	Nil	..
Boulia	30·08	74	45	87	6	34	29, 30	Nil	.
Thargomindah	30·21	65	45	80	6	35	29, 30	195	5

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

AUGUST.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.18	Cairns	17	41	Longreach	29	40
6	6.27	5.21	Charleville .	26	28	Quilpie	36	34
11	6.23	5.23	Cloncurry . .	41	58	Rockhampton ..	4	16
16	6.19	5.26	Cunnamulla ..	30	28	Roma	16	18
21	6.14	5 28	Dirranbandi .	21	17	Townsville .	15	35
26	6.10	5.31	Emerald . .	14	24	Winton	33	47
31	6.4	5.33	Hughenden .	26	44	Warwick .. .	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	a m.	p.m.
1	2.27	12.59
2	3.32	1.54
3	4.37	2.57
4	5.38	4.07
5	6.33	5.19
6	7.21	6.31
7	8.02	7.41
8	8.40	8.48
9	9.15	9.52
10	9.49	10 55
11	10.24	11.58
12	11.02	..
		a.m.
13	11.43	1.00
	p.m.	
14	12.28	2.01
15	1.18	2.59
16	2.11	3.52
17	3.06	4.42
18	4.03	5.26
19	4.58	6.04
20	5.53	6.39
21	6.45	7.09
22	7.37	7.38
23	8.29	8.05
24	9.22	8.33
25	10.16	9.02
26	11.13	9.34
27	..	10.09
	a.m.	
28	12.14	10.51
29	1.17	11.40
		p.m.
30	2.20	12.38
31	3.22	1.43

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17 Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	11	29	26	44	0	20	28	52
6	13	25	28	41	3	16	31	47
11	24	13	41	28	16	3	47	32
16	30	9	46	24	21	0	53	26
21	23	15	39	30	14	6	44	35
26	13	25	28	41	3	16	31	48
31	9	30	25	45	0	21	26	53

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	7	52	36	65	20	50	7	44
3	3	55	34	67	18	52	4	45
5	6	48	35	62	20	48	6	40
7	19	37	42	56	27	41	17	32
9	30	24	51	46	35	32	25	21
11	42	13	58	30	43	24	35	13
13	51	8	65	36	49	21	42	8
15	55	3	68	32	51	18	45	4
17	54	3	67	32	51	18	44	4
19	46	9	62	36	47	22	38	9
21	37	19	55	43	40	28	31	17
23	27	28	49	49	33	34	23	24
25	18	38	42	56	27	41	16	33
27	8	47	36	62	21	47	8	39
29	5	51	35	64	19	50	5	43
31	3	55	34	67	18	52	4	45

Phases of the Moon.—New Moon, August 5th, 2.13 p.m.; First Quarter, August 12th, 5 40 a.m.; Full Moon, August 20th, 3.32 a.m.; Last Quarter, August 28th, 4.46 a.m.

On August 15th, the Sun will rise and set about 17 degrees north of true east and true west respectively, and on August 9th and 23rd, the Moon will rise and set approximately at true east and true west respectively.

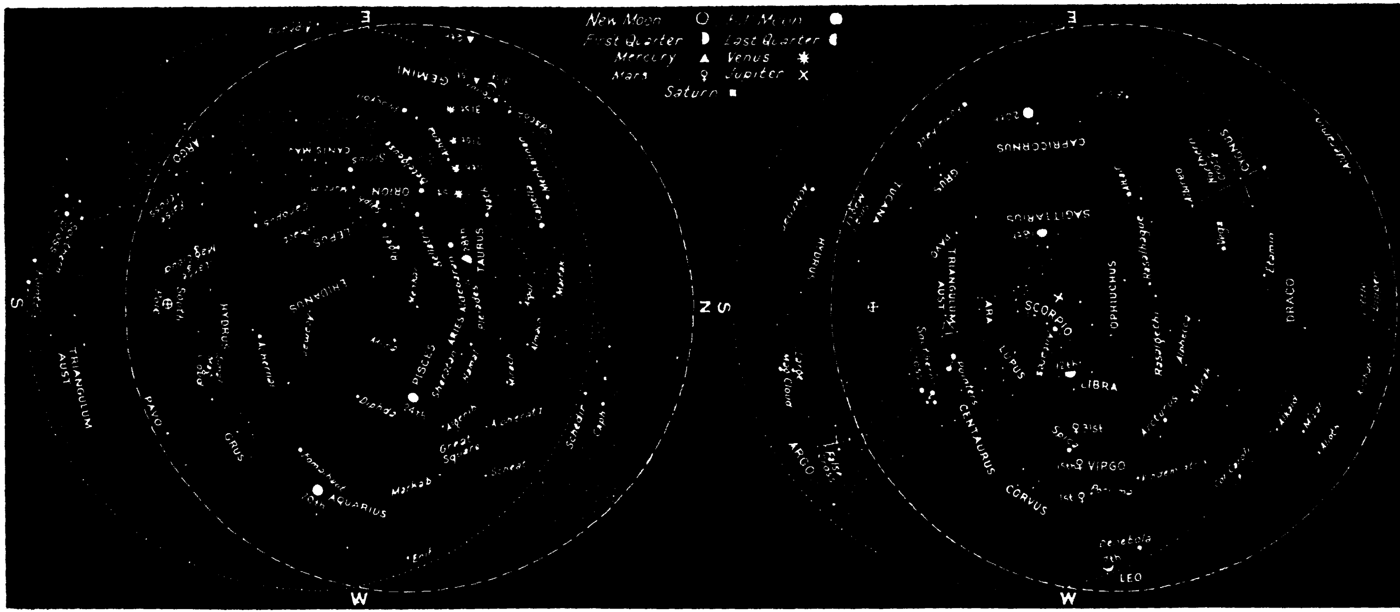
Mercury.—In the constellation of Gemini at the beginning of August and will then rise about 40 minutes before the Sun. It will be in line with the Sun on the 11th and at the end of the month, in the constellation of Vergo, will set 1¼ hours after the Sun.

Venus.—In the constellation of Gemini. On the 1st will rise between 3.30 a.m. and 4.30 a.m. and at the end of the month between 3.15 a.m. and 4.15 a.m.

Mars.—In the constellation of Vergo, at the beginning of the month will set between 9.50 p.m. and 10.50 p.m. On the 22nd it will pass 2 degrees to the north of Spica and at the end of the month will set between 9.15 p.m. and 10.30 p.m.

Jupiter.—Now rising about mid-day and almost overhead by nightfall. On the 1st it will set between 3.15 a.m. and 4.15 a.m., and by the end of the month between 1 a.m. and 2.15 a.m.

Saturn.—Now too close to the Sun for observation, being in line with the Sun on the 19th.



Star Charts.—The chart on the right is for 7.15 p m , in the south-east corner of Queensland, to 8.15 p m. along the Northern Territory border on the 15th August. (For every degree of longitude we go west, the time increases by 4 minutes.) The chart on the left is for 10 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month, the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the Moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

ASTRONOMICAL DATA FOR QUEENSLAND.

SEPTEMBER.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.3	5.33	Cairns	27	31	Longreach	34	36
6	5.58	5.36	Charleville	27	27	Quilpie	35	35
11	5.52	5.38	Cloncurry	48	52	Rockhampton ..	9	11
16	5.46	5.40	Cunnamulla ..	29	29	Roma	17	17
21	5.40	5.42	Dirranbandi ..	19	19	Townsville.. ..	22	27
26	5.35	5.45	Emerald	18	20	Winton	38	42
30	5.30	5.46	Hughenden ..	33	37	Warwick	8	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	a.m.	p.m.
1	4.18	2.53
2	5.08	4.06
3	5.53	5.17
4	6.33	6.26
5	7.09	7.33
6	7.44	8.39
7	8.21	9.44
8	8.58	10.48
9	9.39	11.52
10	10.23	..
		a.m.
11	11.12	12.53
	p.m.	
12	12.05	1.49
13	1.00	2.40
14	1.56	3.26
15	2.52	4.05
16	3.47	4.41
17	4.40	5.12
18	5.33	5.41
19	6.25	6.09
20	7.18	6.36
21	8.12	7.05
22	9.08	7.35
23	10.07	8.09
24	11.08	8.48
25	..	9.34
	a.m.	
26	12.10	10 27
27	1.11	11.27
		p.m.
28	2.07	12.34
29	2.58	1.43
30	3.44	2.53

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS)

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS)

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	10	29	26	44	0	19	28	52
6	21	15	37	31	12	7	43	35
11	30	9	46	24	21	0	53	26
16	25	13	42	28	16	2	48	31
21	14	23	30	39	5	14	34	44
26	9	30	25	45	0	21	26	53
30	13	25	28	41	3	16	31	48

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	6	51	35	64	20	50	6	43
3	16	39	41	57	26	42	14	34
5	27	27	49	48	33	33	23	23
7	40	15	57	41	42	26	33	14
9	50	6	64	34	48	20	41	7
11	55	3	68	32	51	18	45	4
13	55	3	68	32	51	18	45	4
15	47	8	63	36	47	21	39	8
17	39	17	56	42	41	27	33	16
19	29	26	50	47	35	33	25	22
21	19	37	42	56	27	41	17	32
23	9	46	37	61	21	47	8	38
25	3	53	34	66	18	51	4	44
27	2	56	33	67	17	53	3	46
29	8	48	36	62	21	48	8	40
30	13	43	39	59	24	45	12	36

Phases of the Moon.—New Moon, September 3rd, 9.21 p.m.; First Quarter, September 10th, 5.05 p.m.; Full Moon, September 18th, 7.43 p.m.; Last Quarter, September 26th, 3.07 p.m.

Volume 67 Part 2

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Edited by
C. W. WINDERS, B.Sc.Agr.

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3

Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Art, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Poison Plants Investigations.

MANY of the deaths of livestock from plant poisoning which occur each year can be traced to plants well known to be toxic. In the sheep grazing areas there are a score or more of plants which are known to be dangerous to stock, and in the cattle raising and dairying districts also there occur many plants which are definitely responsible for stock losses. There are, however, numerous cases of poisoning of which the cause is uncertain, though particular plants may be suspected, and other cases in which suspicion cannot be said to attach to any one plant.

Where a plant is definitely known to be poisonous, livestock owners can to some extent adopt preventive measures to protect their stock from being poisoned. Should the plants be eaten, and sickness result, very often a proven antidote is available. Cases of poisoning which cannot be traced to a known poisonous plant are not so readily treated nor guarded against.

For very many years prior to 1937 the Department was giving attention, though somewhat sporadically, to known and suspected poisonous plants, and some of its earlier officers made valuable contributions to our knowledge of both cause and treatment of plant poisoning. Many obscure troubles, however, defied solution, and in order to make a concerted attack on these problems a Poison Plants Committee, consisting of technical officers of the Department of Agriculture and Stock and the University, was constituted in 1937. The objective of the Committee was to determine to what extent plants are the cause of certain

troubles, what poisonous principles are involved, how the poisons work, and what remedies can be employed. Until wartime conditions caused the cessation of active work on plant poisoning investigations, the Committee had performed valuable work in incriminating or exonerating various plants and in recording a mass of information on plant poisoning generally.

The Poison Plants Committee has now recommenced operations and as far as staff conditions and facilities permit will continue the investigations from the botanical, toxicological and veterinary aspects. Among other important troubles which possibly have their origin in poisonous plants, Georgina sickness, Birdsville horse disease, and Tallebudgera horse disease will be further investigated. It is confidently expected that a concerted attack on these problems will disclose their causes and possibly their remedies.

An Educational Contest.

CONGRATULATIONS to the Upper Burnett newspaper, the "Monto Herald," for initiating a novel competition designed to inculcate the principles of soil conservation in the minds of the young.

The competition takes the form of a contest for model builders, who are required to model a farm layout for an average dairy farm of 300 acres of sloping land in the Monto district, with some flat or creek cultivation. The largest points section is that covering effectiveness of layout from the point of view of soil conservation. Ideas for water conservation are also well rewarded

The keen competitor will need to inform himself on the principles of soil conservation. This self-education on a subject so vital to farming in Queensland will serve a very useful purpose.

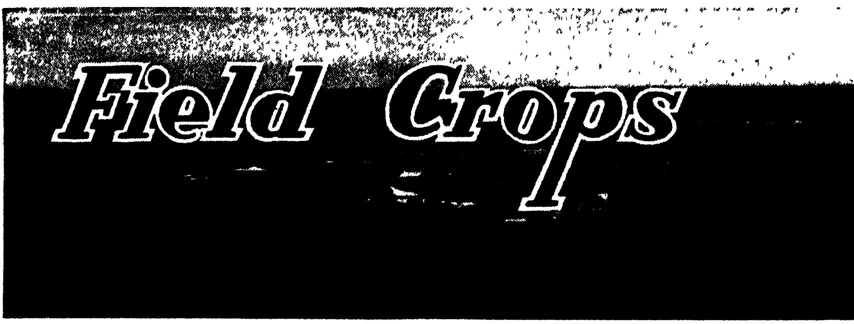
The originators of the competition and those who are supporting it have the commendation of all concerned with the future of Queensland agriculture.

Tomato Seed Certification.

FOLLOWING a period of variety testing and selection of superior tomato plants, the Department of Agriculture and Stock has initiated a seed certification scheme for four varieties.

Announcing that several growers in the Stanthorpe area will be producing seed for certification in the coming summer, the Minister for Agriculture and Stock (Hon. H. H. Collins) said that the original seed had come from crops which had produced high yields of good quality fruit in the Granite Belt. Certified seed taken from the new plantings could be expected to be far ahead of anything else available for the Stanthorpe area for the production of heavy cropping plants of uniform growth and not unduly susceptible to disease.

The four strains included in the scheme are Sioux Q1 (early-maturing), Grosse Lisse Q2 (mid-season), Valiant Q3 (late-maturing) and Rutgers Q4 (late-maturing). They have been selected expressly for Granite Belt conditions and may not be satisfactory elsewhere.



Fertilizer Facts for Farmers.

F. B. COLEMAN, Standards Branch.

THE present Fertilizers Act is based on the experience of past years and came into active operation on 1st January, 1936, when the then existing Act was repealed.

Fertilizers are used for the purpose of supplying to the soil for the use of plants, nitrogen, phosphoric acid, potash, sulphur, magnesia, boron, copper, zinc, manganese and cobalt. All these may be termed the active constituents of the fertilizer in which they are contained.

Because of price, over-concentration, and non-availability to the plant, with the exception of sulphur, these active constituents are applied in compounds or mixtures in which they are present in varying amounts.

The actual "straight" fertilizers that are now upon the Queensland market are—

Nitrate of soda	Superphosphate	Rock phosphate
Sulphate of ammonia	Bone dust	Sulphate of potash
Dried blood	Meatworks fertilizer	Muriate of potash

A large proportion of the fertilizer distributed in Queensland is sold in the form of mechanical mixtures—i.e., mixtures containing two or more of the abovementioned "straight fertilizers" in varying quantities.

The composition of various straight fertilizers is set out in the following, but it should be understood clearly that the proportions vary and the figures given should be taken merely as a guide.

NITRATE OF SODA.

Nitrate of soda, a product of Chile, is a soluble salt that is found in rainless areas. It is mined and passed through various purification processes. Nitrate of soda is a free-running, granular product, much superior to the damp, lumpy material of many years ago. Its composition is as follows:—

	Per cent.
Nitrate of soda ..	97 containing 16·0 per cent. nitrogen
Impurities and water	3
	100 per cent.

In other words, nitrate of soda is composed of nitrogen combined with oxygen and sodium to approximately 97 per cent. with approximately 3 per cent. impurities.

SULPHATE OF AMMONIA.

Sulphate of ammonia is composed of ammonia in combination with sulphuric acid. It may be manufactured in several ways, and has a small percentage of impurities associated with the method of manufacture. Its composition may be set out as follows:—

	Per cent.
Sulphate of ammonia	97·1 containing 20·6 per cent. nitrogen
Moisture and impurities	2·9
	100 per cent.

Sulphate of ammonia of 21 per cent. nitrogen content would naturally have a slightly lower percentage of impurities.

Sulphate of ammonia is either manufactured as a by-product of gasworks or fixed from the air. In simple terms, it is composed of nitrogen and oxygen from the air, hydrogen from water, and sulphur.

ROCK PHOSPHATE.

(Nauru or Ocean Island.)

A good sample of rock phosphate may be analysed as follows:—

	Per cent.
Tricalcium phosphate ..	87·0 containing 39 per cent. phosphoric acid
Calcium carbonate ..	4·5
Calcium fluoride	1·0
Free water	1·5
Organic matter	0·5
Impurities: Iron, alumina, silica, insoluble, etc. ..	5·5
	100 per cent.

The percentage of phosphoric acid ranges actually from 37 to 39, and 37 may be taken as a safe guarantee. This material is obtained from Nauru and Ocean Islands.

This rock phosphate is used for the manufacture of superphosphate.

SUPERPHOSPHATE.

The process of manufacture involves the grinding of phosphatic rock to a very fine degree, and then mixing two parts to one part of sulphuric acid, which process renders almost all of the insoluble phosphoric acid in the rock phosphate water-soluble.

In other parts of the world superphosphates are obtainable at a cost per ton lower than in Australia but such material has a lower water soluble phosphoric acid content. In Australia the "super" sold is as high a grade as is sold anywhere in the world, excepting, of course, "double super."

Composition of superphosphate—

	Per cent.	
Water-soluble phosphate of lime ..	35	containing 20·5 per cent. water-soluble phosphoric acid
Free phosphoric acid	1	
Citrate-soluble phosphate of lime ..	1·5	containing 0·5 per cent. citrate-soluble phosphoric acid
Insoluble phosphate of lime	2·5	containing 1 per cent. insoluble phosphoric acid
Calcium sulphate (including gypsum)	48	
Moisture	7	
Impurities (silica, &c.)	5	
	100 per cent.	

The following figures, often met with, are explained respectively thus:—

20·5 *per cent. phosphoric acid*: This refers to the water-soluble phosphoric acid present.

22 *per cent. super.*: This refers to the total phosphoric acid—

20·5 per cent. water-soluble
0·5 per cent. citrate-soluble
1·0 per cent. citrate insoluble

22·0 per cent. total

45 *per cent. soluble phosphate*: This is a theoretical calculated figure obtained by converting 20·5 per cent. water-soluble phosphoric acid to tricalcic phosphate, which is the insoluble calcium phosphate (occuring in bone and rock phosphate).

48 *per cent. tricalcic phosphate*: This is a theoretical calculated figure obtained by converting the 22 per cent. total phosphoric acid to tricalcic phosphate.

It should be noted that all the above expressions are used in connection with the one superphosphate on the Queensland market; the only useful figure for comparison, however, is the 20·5 per cent. water-soluble phosphoric acid.

Superphosphate is made in Queensland.

SULPHATE OF POTASH.

The sulphate of potash at present available in Queensland is prepared in Western Australia from alunite, a material containing aluminium as well as potash. After processing, the portion sold as a fertilizer is composed of—

	Per cent.	
Sulphate of potash ..	53	containing 29 per cent. potash (K_2O)
Other sulphates and impurities	46	
Water	1	
	100 per cent.	

CHLORIDE (MURIATE) OF POTASH.

This is composed of—

	Per cent.
Chloride of potash ..	95 containing 60 per cent. potash (K_2O)
Common salt, sulphates and other chlorides	4
Water	1
	100 per cent.

The potash content varies from 60 to 62 per cent (K_2O).

Our potash supplies come from the Dead Sea in Palestine and from France.

MEATWORKS BY-PRODUCTS.

These materials, being of organic origin—as will be seen—vary in composition. It is possible that materials of different nitrogen and phosphoric acid content from those set out below may be met with.

Blood.—The following composition is typical:—

	Per cent.
Crude protein	81·25 containing 13 per cent. nitrogen
Moisture, organic matter, etc.	18·75
	100 per cent.

Usually the dried blood on the Queensland market contains from 11 to 13 per cent. of nitrogen. Very little dried blood is available as most is used in the manufacture of stock foods.

Bone.—An average quality bone dust is composed of the following:—

	Per cent.
Crude protein ..	22 containing 3·5 per cent. nitrogen
Tricalcic phosphate of lime	50 containing 23 per cent. phosphoric acid
Moisture, organic matter, etc. ..	28
	100 per cent.

Bone dust in Queensland contains from 3 to 3·5 per cent. nitrogen and 22 to 23.5 per cent. phosphoric acid. Generally speaking, the more the bone is subjected to steam heating or sterilizing, the lower becomes the nitrogen and the higher the phosphoric acid.

Highly sterilised bone is sold as a stock food and may contain less than 1 per cent. of nitrogen and over 30 per cent. of phosphoric acid.

Meatworks Fertilizer is composed of flesh, bone, and sometimes blood; it can have the following analysis:—

	Per cent.
Crude protein ..	37·5 to 18·75 containing 6 to 3 per cent. nitrogen.
Tricalcic phosphate of lime	31 to 50 containing 14 to 23 per cent. phosphoric acid.
Moisture, organic matter, etc. ..	31·5
	100 per cent.

It should be noted that as the nitrogen increases the phosphoric acid decreases and *vice versa*.

In explanation of the figures given above, it may be stated that nitrogen may be converted to crude protein by multiplying by 6¼.

OTHER MATERIALS.

In addition to nitrogen, phosphorus and potash, there are numbers of elements such, as sulphur, magnesia, copper, zinc, boron, manganese and cobalt, which are now assuming considerable importance in agricultural practices.

It has been found that deficiencies of these elements may affect very considerably the intake of nitrogen, phosphorus and potash absorbed by the plant.

Mixtures are now available which contain these ingredients, and the Regulations under the Fertilizers Act prescribe that the amount of these elements and the form in which they occur in the fertilizer mixture shall be stated on the label.

In addition, the practice is now being introduced of incorporating, in certain instances, pest-control materials. An example of this is the use of benzene hexachloride in sugar fertilizer mixtures for the control of wireworm. The amount of benzene hexachloride and the percentage of the gamma isomer—the active constituent—are required to be shown on the label relating to such fertilizer.

MIXED FERTILIZERS.

Having reviewed the chief fertilizers that are used in Queensland to compound mixtures, the task of making up some mixed fertilizers from formulæ can be considered.

As an illustration, consider a mixture of equal parts by weight of the following ingredients:

Material used.	*Containing.*
Sulphate of ammonia ..	20·6 per cent. nitrogen.
Superphosphate	20.5 per cent. water-soluble phosphoric acid.
Blood, bone and offal	5·0 per cent. nitrogen as bone. 16·0 per cent. phosphoric acid as bone.
Chloride of potash	60·0 per cent. potash as chloride.

Amount of Material used.	*Calculated per cent. obtained.*		
	Nitrogen. Per cent.	Phosphoric acid. Per cent.	Potash. Per cent.
25 per cent. sulphate of ammonia	5·15	—	—
25 per cent. superphosphate	—	5·12	—
25 per cent. blood, bone and offal	1·25	4·0	—
25 per cent. chloride of potash	—	—	15
100 per cent.			

The Fertilizers Act requires minimum guarantees to be stated on the label.

A label for the mixture set out above, if offered for sale, would read as follows:—

Fertilizer Mixture.

lb. net.

5.15 per cent. nitrogen as sulphate of ammonia.
1.25 per cent. nitrogen from blood, bone and offal.
5.12 per cent. phosphoric acid water soluble from superphosphate.
4.0 per cent. phosphoric acid from blood, bone and offal.
15.0 per cent. potash as chloride (muriate) of potash.

Fine per cent.
Coarse per cent.

Name and address of seller or manufacturer.

"Fine" and "coarse" are explained later.

Now, by adding the various active constituents together, we obtain 6·4 per cent. nitrogen, 9·12 per cent. phosphoric acid and 15·0 per cent. potash. This would be classed as a 6·4–9·1–15 mixture.

These figures should be used always in the sequence of nitrogen, phosphoric acid and potash, and are designated the *grade formula*.

Now, supposing some one desired a 5·1–7·3–12 mixture, it could be compounded as follows:—

Amount of Material used.	*Calculated per cent. obtained.*		
	Nitrogen. Per cent.	Phosphoric acid. Per cent.	Potash. Per cent.
20 per cent. sulphate of ammonia	4·1	—	—
20 per cent. superphosphate	—	4·1	—
20 per cent. blood, bone and offal	1·0	3·2	—
20 per cent. chloride of potash	—	—	12·0
20 per cent. filler (sand)	—	—	—
100 per cent.	5·1	7·3	12·0

From this it must be realised that it is not possible to compound any *grade formula* picked, at random, in such a way as to give a complete ton of fertilizer; *a filler may have to be used.*

Consequently, this aspect should be considered before some *fancy grade formula* is requested. Even if a filler can be obtained for nothing, freight, handling, and mixing costs must still be paid on it.

If this material is to be offered for sale, the label should read—

. . . . . Fertilizer Mixture.

.. .. lb. net.

4.1 per cent. nitrogen as sulphate of ammonia.
1.0 per cent. nitrogen from blood, bone and offal.
4.1 per cent. phosphoric acid water-soluble from superphosphate.
3.2 per cent. phosphoric acid from blood, bone and offal.
12.0 per cent. potash as chloride (muriate) of potash.
20.0 per cent. sand.

Fine .... per cent.
Coarse.. .. .. . per cent.

Name and address of seller or manufacturer.

FINENESS.

All organic fertilizers—i.e., blood, bone, and meatworks—depend upon their fineness of division to a great extent for their availability—i.e., the finer they are the greater is the surface exposed, and the more quickly does decomposition take place.

The regulations prescribe the following standards for fineness:—

	Fine. Material that passes through apertures of	*Prohibited.* Material that will not pass apertures of
Bone dust	$\frac{1}{50}$ in. square ..	$\frac{1}{10}$ in. square
Dried blood .. .. / Meatworks .. .. / Mechanical mixtures..	$\frac{1}{50}$ in. square ..	$\frac{3}{16}$ in. square
Rock phosphate .. / Phospho guano ..	$\frac{1}{50}$ in. square ..	$\frac{1}{8}$ in. square
Lime	$\frac{1}{100}$ in. square ..	$\frac{1}{8}$ in. square

"Coarse" material is the particles that are larger than "fine" and smaller than "prohibited."

It should be understood clearly that the percentage of "Fine" and "Coarse" shown on labels of mixtures relates to the organic material only, except in the case of lime, rock phosphate, and phospho guano.

The method of analysis provides that all chemical material (almost completely water-soluble or capable of being broken down by water) shall be washed out, and the organic blood, bone, flesh, and offal only shall be "tested for fineness." The percentage of "coarse" is that portion of the insoluble organic material that is retained on the specified sieve.

FILLER.

Any fertilizer containing a filler must show on the label the percentage of filler. "Filler" is any material, contained in any fertilizer, that does not contain in appreciable quantities an ingredient containing an active constituent beneficial to the growth or health of the plant—for example, earth, sawdust, ashes and antbed.

Fillers are merely added, as explained above, to make the weight of fertilizer up to a ton—or for other less worthy reasons.

A clearer explanation would be—

Sulphate of ammonia is not filler, because it is used to supply nitrogen.

Superphosphate is not filler, because it is used to supply phosphoric acid.

Rock phosphate is not filler, because it is used to supply phosphoric acid.

Sulphate of potash is not filler, because it is used to supply potash.

Cottonseed meal is not filler, because it could be used to supply nitrogen.

Magnesium sulphate is not filler, because it is used to supply magnesia.

CALCULATIONS.

In order to assist in the explanation as to how to obtain the weight of ingredients to use, to obtain a certain guarantee, or the guarantee that would result from the use of any proportion of ingredients in a mixed fertilizer, the method of questions and answers has been resorted to.

Calculations have been made to the nearest pound only.

Question.—How much sulphate of ammonia shall I use in 1 ton to obtain 5 per cent. of nitrogen?

Answer.—Formula to use:—

$$\frac{\text{Total weight required} \times \text{Per cent. of Active Constituent required}}{\text{Per cent. of Active Constituent in Ingredient used}} = \text{Weight of Ingredient to be used.}$$

Calculation—

$$\frac{2{,}240 \text{ lb.} \times 5}{20{\cdot}6} = 544 \text{ lb.}$$

Therefore, 544 lb. of sulphate of ammonia (containing 20·6 per cent. nitrogen) in 1 ton of fertilizer would give 5 per cent. nitrogen.

Question.—If I use 544 lb. of sulphate of ammonia (containing 20·6 per cent. nitrogen) in 1 ton of fertilizer, what would be the percentage of nitrogen present?

Answer.—Formula to use:—

$$\frac{\text{Weight of Ingredient used} \times \text{Per cent. Active Constituent in Ingredient used}}{\text{Total Weight}} = \text{Per cent. Active Constituent present.}$$

Calculation—

$$\frac{544 \text{ lb.} \times 20{\cdot}6}{2{,}240} = 5 \text{ per cent. Nitrogen.}$$

Therefore, 5 per cent. nitrogen, as sulphate of ammonia, would be present in 1 ton of fertilizer containing 544 lb. of sulphate of ammonia.

The various other percentages obtainable from different ingredients would be calculated similarly.

LIME.

The Fertilizers Act applies to lime for agricultural purposes as well as to fertilizers. This has been dealt with comprehensively in a previous issue of this *Journal.*

THE FERTILIZERS ACT OF 1935.

The following are the main requirements of the Fertilizers Act:—

Every dealer must be licensed to sell fertilizer and lime for agricultural purposes (cost £1 1s. yearly).

Every fertilizer or lime must be registered yearly.

Every sale of fertilizer or lime over the value of 10s. must be covered by an invoice and warranty.

Every bag of fertilizer or lime must be labelled.

Every bag of fertilizer must be branded with the brand and name of the fertilizer.

Any buyer who desires to have an analysis made of a fertilizer or lime that he has purchased must give notice to the seller, within fourteen days of delivery, of his intention to have it analysed, and must also comply with the provisions set out in Regulation 15 under the Fertilizers Act.

OFFENCES.

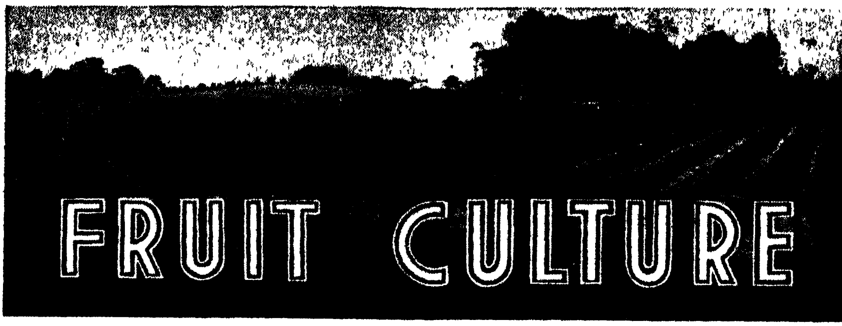
The Fertilizers Act is for the purpose of protecting buyers, and any irregularity, actual or suspected, should be *reported immediately* to the Standards Branch in order that investigation and necessary action may be taken at once.

EXPLANATION OF TERMS.

The following terms, often met with, have the meanings as set out hereunder:—

N	= Nitrogen
P_2O_5	= Phosphoric acid
K_2O	= Potash
Super	= Superphosphate
Sulp. amm. or amm. sulp.	= Sulphate of ammonia
Pot. chlor. .. .. / Muriate of potash ..	= Potassium chloride
Tricalcic phosphate of lime	= Phosphoric acid and lime in combination in the insoluble form

Grade formula expresses the respective percentages of nitrogen, phosphoric acid, and potash in the order given and guaranteed to be present by the dealer in mixed fertilizers, such as 5½–10–12.



Pineapple Culture in Queensland.

H. M. GROSZMANN, Horticulturist.

THE pineapple comes from the tropics and belongs to a family of plants (*Bromeliaceae*) many of whose members inhabit trees and rocks, their shallow roots surrounded by decaying bark and leaf mould. While the pineapple is a ground dweller, it has still the specialized root structures of its tree-dwelling relatives. Like them, it cannot stand poor aeration, and it prefers a soil rich in decaying plant matter. This helps to provide the acid conditions, the mineral nutrients, and the even temperature and moisture which the roots require.

STRUCTURE AND FRUITING HABIT OF THE PINEAPPLE PLANT.

The structure of the plant and its fruiting habit can best be described by referring to Plate 19, which shows a plant bearing a mature fruit.

The dense root system rises from the axils of leaves at the base of the short stem. From this stem radiate fleshy, trough-shaped leaves, and it is from the apex or growing point of the stem at the centre of the plant that the single fruit arises when the plant is sufficiently developed. Only one fruit is borne on the one stem. The subsequent or first ratoon crop is produced by off-shoots called suckers, which grow from the parent stem when it begins to fruit. These bear fresh suckers which, in their turn, provide the next or second ratoon crop, and so on.

Other off-shoots frequently grow from the fruit stalk. These are called slips. At their bases they generally have a small fruit-like structure or "pinelet" which in time decays. Unlike suckers, slips do not fruit as long as they remain on the parent plant.

The "fruit" is really a compound structure derived from a flower spike, and consisting of numerous fruitlets or eyes, each of which comes from a single flower. Through the centre of the fruit runs the core, really a continuation of the fruit stalk, and terminated by a vegetative offshoot, the crown.

In the axil of nearly every leaf on the plant are buds from which new plants could possibly grow, but the chief types of commercial planting material are slips, suckers, crowns or tops, and sometimes the butts or stems which have produced a fruit.

VARIETIES.

There are numerous varieties of pineapples, but only a few of them are of economic importance in Queensland. The main commercial varieties are the Smooth Cayenne and the rough-leaved Queen and Ripley Queen.

Plate 19.

A Plant of the Smooth Cayenne Variety with Leaves Cut Away to Show the Various Plant Parts.—(1) Roots; (2) stem; (3) fruit; (4) top or crown; (5) ground sucker; (6) sucker; (7) slip.

Plate 20.

SUMMER-FRUITING TYPE.—Note cylindrical fruit set low between advanced suckers.

Plate 21.

WINTER-FRUITING TYPE.—Fruit conical and set high on the plant. Note comparative backwardness of suckers.

The Smooth Cayenne is easily the most important, supplying as it does the whole requirement of canned pineapple as well as the greater part of the fresh fruit trade; and it is with this variety that this article is chiefly concerned. In general, however, the other varieties have similar cultural requirements.

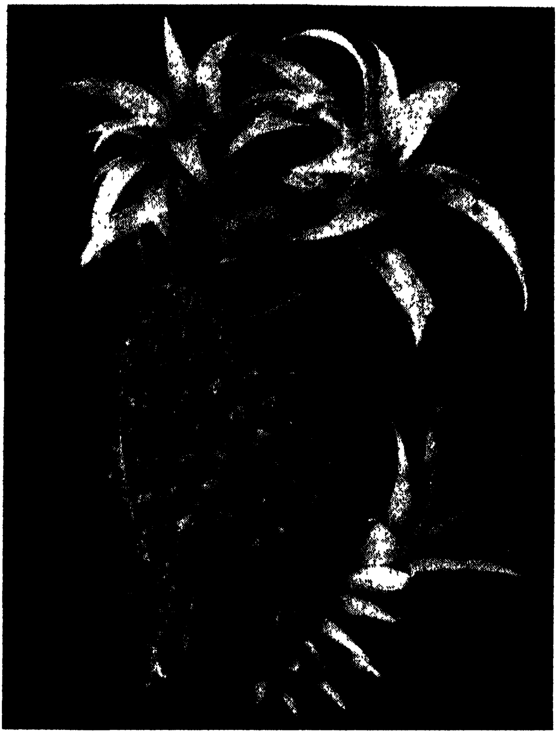


Plate 22.

ORIGIN OF A MUTATION.—A Smooth Cayenne fruit with one normal smooth crown, and another crown which has mutated to roughness.

PLANT VARIATION.

Where plants are propagated vegetatively—that is, by slips, suckers, or any other offshoot, but not by seed—it is the rule that they remain true to type, all offshoots from the one parent producing similar plants.

In any pineapple plantation, however, it is found that there is considerable variation in plant and fruit type. Some plants are obviously inferior to others, and it is clearly desirable to eliminate the inferior ones. To do this, however, it is necessary to know the causes of the variation which exists from plant to plant. These causes are found to be of two main types.

Firstly, there are differences in environment from plant to plant. Where plants flower at different times of the year (Plates 20 and 21)

different plant and fruit development result. Variations in soil conditions also will cause marked changes in plant growth. Where inferior plants are the result of poor growing conditions the remedy lies in correcting these conditions.

The second reason for variation is that while, as stated above, the great majority of vegetative offshoots have the same hereditary constitution as the parent, occasionally an offshoot does appear which is inherently different from the parent type (Plate 22), and its progeny continue to be different. Such a new type is called a sport or mutant, and it is really a new variety. Inferior sports cannot be restored to normal by improving the growing conditions. The only remedy is to see that no offshoots from such types are used for planting material.

Plate 23.

COLLAR-OF-SLIPS—EXTREME TYPE.—Longitudinal section showing some slips originating from the base of the fruit.

When an abnormal plant is first noticed it is not possible to determine at once whether the abnormal condition is due to environmental differences or to mutation. This can be decided only by growing plants from the abnormal type under good cultural conditions. If the abnormality is environmental it will probably not appear in these plants, while if it is inherent it will. Numerous trials of this kind have been made throughout Queensland plantations, and about thirty mutant types have been found. On the other hand, many abnormalities such as the "Christmas" pineapple, most high-suckering plants, many crippled fruits, and most cases of multiple crown have been shown to be environmental.

Inferior mutants may and do cause considerable loss, particularly if they are not so markedly inferior as to be rejected at once, and if, in addition, they produce a lot of planting material and thus multiply rapidly. Two such types are the collar-of-slips and the "Long Tom." The "dry fruit" type, too, is quite prolific in planting material, but is so inferior that the plant is often pulled out as soon as it is recognised.

Plate 24.

TWO "LONG-TOM" FRUIT COMPARED WITH A NORMAL FRUIT.

Collar-of-slips.

The collar-of-slips type (Plate 23) is distinguished by the presence of slips arising from near the base of the fruit or even from the base of the fruit itself. Usually, though not invariably, there is an excessive number of slips, not all of which, however, arise from the base of the fruit. The fruit, which frequently carries knobs at the base as well as slips, is often small and somewhat tapered at the top. Owing to excessive slip production, suckering is generally greatly retarded. Removal of the slips during harvesting is very troublesome, and tearing of the base of the fruit will result in injury to it. The collar-of-slips type is, therefore, very undesirable.

To eliminate collar-of-slips, no planting material should be taken from the following:—

(*a*) Plants bearing any slips close to the base of the fruit;

(*b*) Plants bearing any slips with the main winter crop;

(*c*) Plants bearing an excessive number of slips under any circumstances (say, more than three in an average plantation or more than five in very vigorous or in "hold-over" plantations).

"Long Tom."

The "Long Tom" type (Plate 24) is distinguished by the length and narrowness of the fruit, which, in addition, is often very knobby. The

fruit usually matures late, and as suckering is further delayed by the heavy slip production the ratoon crop is retarded considerably. The numerous slips are not clustered at the base of the fruit. Often the fruit, though still of distinctive shape, may be of moderate size, but when produced under less favourable conditions it is mostly of inferior type.

PLANT SELECTION.

As mutation is not a frequent occurrence, selection will cause a rapid and lasting improvement in plantations where, through ignorance or carelessness, inferior types have been allowed to multiply over a long period. Still, mutation, while it is rare, does occur and the grower must be on the watch continually to cull out the poorer sports as they appear.

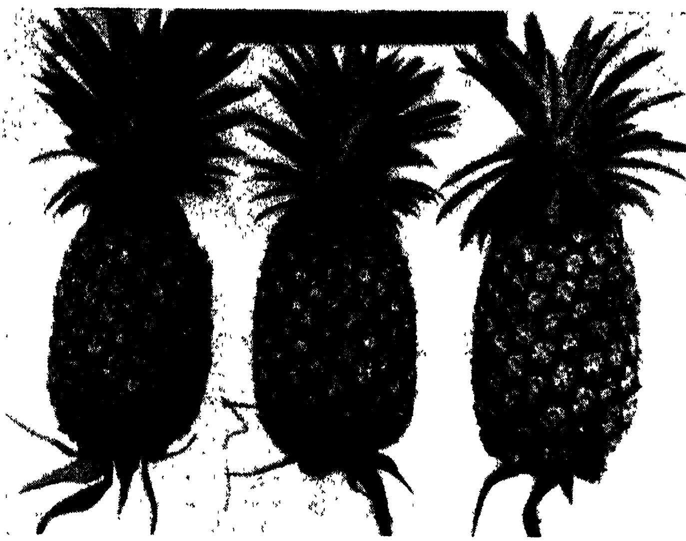


Plate 25.
FRUIT OF DESIRABLE TYPE.

The simplest and quickest method of improving the stock is by mass selection. This involves making a thorough examination of the plantation just before the summer plant crop matures and marking with paint all plants of desirable type. In this first selection not only should distinctly inferior sports be avoided but also any plant which appears below average, thereby eliminating minor defects which may be inherent. All material from selected plants should then be bulked together and grown in a separate area, and the grower should endeavour, by fresh selections and by natural increase from selected areas, to reach the stage where selected plants will supply his whole requirement of planting material.

The type of plant to select is one bearing a cylindrical fruit of good size with square shoulders and base (Plate 25) set low between two or three well-grown suckers, with only a few slips placed well below the fruit.

While the main emphasis has been laid on the elimination of inferior sports, it is quite possible for superior types to arise by

mutation, and even a slight margin of superiority is well worth the selection. The grower noticing any plants which appear outstanding would thus do well to multiply such plants, keeping the progeny of each plant separate.

INFLUENCE OF ENVIRONMENT.

Climate.

The pineapple is adapted to a tropical climate, and when grown in the sub-tropics it must be confined to frost-free localities. Even then the plant often suffers considerably in cold or exposed sites and is almost dormant from May to August, inclusive. Growth occurs mostly in the warm, moist summer weather. In areas where light frosts occur the damage may be minimised by covering the tops of the fruit with woodwool or by covering the whole of the double row with grass. Apart from the risk of frost damage, fruit maturing late in the winter has a marked tendency to develop physiological disorders such as black heart, and this condition is most prevalent in cold, exposed localities.

Extremes of heat, too, can cause extensive damage, and once the temperature reaches 90 deg. F., particularly after moist, cloudy weather, the fruit is liable to sunburning. Fruit lying over on its side is particularly susceptible to sunburn. While this damage is most likely to occur when fruit is nearly mature, there have been cases of severe burning of half-grown fruit as early as November, and burning can occur as late as the end of March. Throughout pineapple-growing districts it is the practice to cover summer fruit with woodwool, paper covers, or grass, particular attention being paid to the side facing the early afternoon sun.

One of the most important factors in pineapple production is the seasonal distribution of rainfall, which should be such as to provide adequate soil moisture throughout the year, and particularly in the warmer growing months of spring and summer. In Queensland the spring months are generally too dry, and especially so in some of the northern parts of the State. However, in much of the level land of northern Queensland it is possible to remedy this with irrigation.

In southern Queensland probably more damage is caused by excessive late summer rains, leading to waterlogging with its attendant diseases, such as wilt, base rot, and heart rot. This calls for careful drainage.

Aspect.

When grown in the sub-tropics the pineapple likes full sunlight, and does best on a northerly aspect. However, southerly aspects are sometimes used, but under these conditions plants tend to flower later. In a dry season the southerly aspect has the advantage that the soil does not dry out as much as on northerly slopes.

In all situations protection from cold or drying winds is desirable. Cold winds in spring, especially on the basaltic plateaux, may cause a great deal of crippling and cracking of the developing summer crop.

Seasonal Variation in Plant and Fruit Growth.

There are two main flowering periods, namely, the autumn and the spring, and type of fruit and vegetative growth (Plates 20 and 21) are markedly influenced by the time of flowering.

When a plant flowers in spring, say about the middle of September, the inflorescence has been formed in the heart of the plant some time before, that is, during cold, dry weather. The number of flowers or eyes is comparatively small, and the fruit stalk, which develops early, is relatively short. However, the plant now passing into warm, moist growing weather, is able to develop the fruit well, so that it is cylindrical with square shoulders and base, and is generally rich in sugar. The weather is so favourable that buds on the fruit stalk develop into slips, and the suckers are well grown before the fruit is picked in February or March, about five months after flowering.

On the other hand, when the plant flowers in March the inflorescence has been laid down during good growing weather and the flowers are numerous. The fruit stalk is fairly long. However, with the advent of cold, dry winter weather, the sucker growth is retarded, slips fail to develop, and the plant is unable to fill out the fruit, which is generally large but tapers towards the crown, which is small. It has not the sugar content of the summer fruit, and is subject to physiological disorders such as black heart. It takes longer to mature, and is not picked until the middle of September for the "winter" crop—that is, about six months after flowering.

In addition to the two main crops there is a sprinkling of flowering throughout the year, and the plant and fruit type show a progressive change from one to the other of the two extremes described above.

These seasonal effects are much more pronounced in the sub-tropical areas of south-eastern Queensland than in the tropical north, where the mild winters cause little check to growth.

Soils.

While good crops are grown on a wide variety of soils these soils have one thing in common in that they are all well drained. Of the various types ranging from sands to clay loams the sandy loams are probably the best. The sands are too low in humus and clay to retain sufficient moisture and mineral nutrients, and the clay loams, while they are fertile, tend to retain too much moisture. The sandy loams, which are intermediate, are ideal because they are well drained and easy to work and yet retain moisture and mineral nutrients reasonably well.

(i.) *Soil Drainage.*—A soil is not necessarily well drained because it is on a slope. Drainage is determined more by the texture of the subsoil. Whether on a flat or on a fairly steep slope any soil that has a sticky clay subsoil less than 18 inches from the surface will be poorly drained. Also, the topography of the land, as well as the presence of shelves of rock or clay approaching the surface, may cause small areas of soil of good texture to be waterlogged at times.

(ii.) *Soil Acidity*—Another important factor is soil acidity. Pineapples prefer acid soils, as high acidity enables the plant to assimilate iron, which is very necessary for healthy growth. Moreover, pineapple roots are adapted to acid conditions, and have even been observed to grow down into the acid juices of the fruit. Acid soil conditions also help to combat one of the most serious of the pineapple wilt diseases.

A simple measure of soil acidity is given by the pH scale, in which the figure 7 represents a neutral condition, while below 7 represents

increasing acidity and above 7 increasing alkalinity. The range most favourable to the pineapple is between pH 4.5 and pH 5. If the soil to be planted has a pH only slightly above 5, it is probable that the acid fertilizers normally in use will correct it. If the pH is above 5.5 the acidity should be increased by applying sulphur to the land in amounts varying from 200 to 600 lb. per acre, the amount depending upon the pH and the texture of the soil. The higher the pH and the heavier the soil the more sulphur is required. A grower can be guided in this matter by plant growth on similar land, but if in doubt he should have soil samples tested by the Department of Agriculture and Stock.

While the pineapple requires acid soil conditions it is known that in very acid soils undesirable changes often take place, especially with regard to soil texture. Consequently, in time it may be necessary to make slight corrective applications of lime; but this has yet to be investigated. In general, heavy liming is harmful to the pineapple, as it tends to make iron unavailable to this plant.

(iii.) *The Humus Content of the Soil.*—Another factor of utmost importance to pineapple soils is the presence of ample humus, which not only affects soil moisture, texture, and acidity, but also plays a leading part in making the soil minerals available to the plant. It is this humus, with its accumulation of minerals, which largely accounts for the fertility of virgin soils. It is the loss of this reserve through faulty soil management which is largely to blame for the poverty of much "replant" land.

Humus comes from decaying plant matter. It can be conserved by planting pineapples closely to shade the soil, and increased by turning in the old crop. It can be both conserved and increased by growing cover crops in the intercycle period.

PREPARATION OF THE LAND.

It is sound practice to prepare the land, whether virgin or "replant," some months before planting in order to reduce weeds as much as possible, as weed control is costly once the area is planted with pineapples.

Virgin Land.

While land is occasionally planted without being stumped, it is more usual to make a thorough job of clearing and stumping, avoiding as far as possible very large fires which damage the soil by burning out the humus and depositing alkaline ash.

Of prime importance in preparing the land is the provision of drainage and the prevention of erosion. A suitable series of surface drains, which removes excessive surface water from the plantation, also serves to reduce erosion by preventing undue concentration of water.

For spring planting land should be reduced to a suitable tilth by August, so that surface drains may be prepared before heavy spring storms are likely and before planting is commenced. The first step is to ensure that any accumulation of water from above the area should be diverted by an adequate drain. Then a series of drains should be provided across the slope with just a slight fall and opening into main drains down natural depressions, if possible outside the plantation. These main drains can sometimes take the form of shallow basins serving as roads, and in all cases they can be grassed with a suitable

grass such as buffalo grass. The distance between drains across the slope depends on the steepness of the slope, being reduced as the slope becomes steeper. Any faults or silting of these drains can be corrected during the first rains.

Accurate contour planting and draining are now being tried extensively in Hawaii, where special harvesting machinery designed to handle large areas planted on the contour has been developed. It is possible that this method of planting might be adapted to our smaller areas. Planting across the slope with little regard to the contours is quite common, as it makes for ease of working on steep slopes, but it has the serious defect that water tends to accumulate at the lowest parts of the rows and to break through, causing considerable erosion. It is preferable to run the rows up and down hill or at an angle of up to 45 degrees to this direction, as by doing this each row drains itself. Whether the rows are planted on the contour or across the slope there will generally be a tendency for soil to accumulate above the top row and to move away from the lower row, which often leads to the collapse of the plants in the latter. This does not happen where the rows run down the slope. It is not yet possible to compare planting on the contour with planting up and down the slope, but it does appear that both are preferable to planting across the slope without regard to contour.

Before planting it is important to plan out rows and headlands for harvesting, and for convenience the length of the rows should not be much more than 2 chains from road to road.

Where it does not conflict with measures for drainage and erosion control, the rows should run north and south so that each side of the row gets its share of sunlight. In northern Queensland, however, an east-west direction may be preferable, as it should help to shade the soil in the inter-row.

Where the land to be planted is rather heavy, or flat with a tendency to water-logging, it is best to plant on raised beds prepared before planting by running deep furrows down the inter-rows and raking in towards the rows.

"Replant" Land.

It is generally considered that replant land is inferior to virgin land. So strongly is this belief held that, in many parts of Queensland, growers prefer to let it lie fallow in grass and weeds for several years while they prepare fresh virgin land at considerable cost.

As the problem of maintenance of fertility cannot be postponed indefinitely by the use of virgin land, it must be overcome.

One of the first measures to be taken is to turn in the old crop, which can be done with either rotary hoe or plough. This results in a considerable return of organic matter and mineral nutrients to the soil. Burning of the old plantings before preparing the land is to be avoided, as this destroys much valuable plant matter. In the absence of accurate information it is probably best on general considerations to leave replanting for at least 12 months after turning in the old planting. This gives the trash time to decompose and allows the soil to settle. It also enables the grower to reduce weeds in the area, and probably helps to reduce plant parasites in the soil.

If the old crop is turned in during the winter the land can be planted with a cover crop such as Poona pea or pigeon pea early in the spring. This cover crop will help to suppress weed growth and to reduce erosion. By shading the soil it will also keep the surface layer moist and comparatively cool, thus reducing harmful oxidation of humus, which is very severe under conditions of high soil-temperatures. A leguminous cover crop will also raise the nitrogen content of the soil. The cover crop may be given a shallow discing after the main summer rains are over, and then a winter cover crop can be planted, to be turned in early in August. However, as winter crops give very variable results, depending largely on residual moisture from the summer rains, it may be preferable to let a perennial legume such as pigeon pea stand until about May. It can then be turned in as part of the preparation for spring planting.

Even with the incorporation of plant matter from the previous crop many "replant" areas have been rather unsatisfactory, and there has been a tendency for the plants to decline rapidly after the first crop. The reasons for this are not clear, but the Department is experimenting with different treatments of the land before replanting is carried out. Investigations are being conducted on the effect of different fallow periods of three months to three years between the crop cycles, together with the use of seasonal and perennial leguminous cover crops. The use of chemicals to combat harmful soil organisms such as nematodes is also being studied.

The use of perennial legumes for periods of up to three years seems to have several advantages over seasonal cover cropping. It entails considerably less work, and does not involve periods of exposure of the land and consequent risk of erosion, weed growth and destruction of humus. It also gives land which has been worked for some years a chance to develop a better structure. One of the most promising plants is pigeon pea, but several species of *Crotalaria* and two other legumes—calopo and stylo—are under observation.

PLANTING.

Planting Material.

One aspect of the choice of planting material has been discussed under plant selection, and the types of planting material were mentioned in the description of the pineapple plant.

The main types of planting material are slips, suckers, tops or crowns, and butts, and any of these, if properly selected and handled, will make good plants.

Whatever plants are used, it is advisable to grade them according to size, placing plants of the same grade together. A small plant has no chance of competing successfully with larger ones planted on either side of it.

Slips.—Large slips, if planted in spring and given good treatment, are almost certain to mature their crop in 18 months. Medium to small slips will need very good conditions to do this, and it is much more usual for them to take two years to produce their crop. A percentage may even "hold over" to two-and-a-half years, but this can be prevented by the use of acetylene or synthetic growth substances to induce flowering. This will be dealt with later.

It must be remembered that the careless selection of slips is largely responsible for the increase of some inferior types of plants such as the collar-of-slips, and the grower should be careful to avoid slips from such plants. Where slips are not required for planting material, they should be removed from the parent plant as soon as possible to reduce competition with the suckers.

Tops.—Summer tops if planted in March and April should be sufficiently advanced to mature a crop in two years. These plants should be handled carefully, and stacked in a single layer, butt end up, in the sun, in order to dry and seal the cut end before planting. On no account should they be heaped in the shade, as they will rot very rapidly. Even with these precautions, should heavy rain fall in autumn soon after planting many plants may be lost from fungal rots. The gaps so created can be filled with slips or suckers in the following spring.

Winter tops, if planted early in the summer, should be sufficiently advanced to mature a winter crop about two years after planting. By delaying planting until about December, the bulk of the plants will probably bear for the summer crop a little over two years after planting and still not be overgrown.

Tops being generally much alike in age and size will naturally tend to fruit more uniformly than slips, which in their turn will be more uniform than suckers; but there are numerous exceptions.

Suckers.—In choosing suckers for planting in the early summer, it is a good plan to wait until the end of September, by which time any suckers likely to flower for the summer crop will have done so. From those suckers which have not flowered, or whose centre leaves show no indication of flowering, well-grown plants can be chosen for planting. It is best to peel some of the base leaves from the sucker to enable the roots to grow out freely. This is often done with slips and tops with beneficial results, but in these cases the need is not as great because the base leaves are not as firm and close. Suckers have the advantage that, in land which is likely to be water-logged at any time, they are not as prone to develop heart rot as are slips and tops. On the average, too, they fruit earlier than the other types of planting material and can be expected to mature their plant crop within 18 months of planting. If suckers are too advanced when planted, they often fruit before they are established, with the result that the fruit is too small and must be broken off and discarded.

Butts.—A plant which has borne a fruit becomes a butt, and such plants, if they have not produced a large sucker, are called first butts. These are quite good planting material. Butts should have their leaves trimmed close to the stem, and they should be planted on their sides in a drill and covered to a depth of about three inches. From one to three plants may appear from each butt and it is usual to let them all grow.

Trimming of Planting Material.

When slips and suckers have to be carried a considerable distance, it is necessary to economise in transport costs by trimming off the leaves to about half their length; but, when transport is no problem, the less trimming that is done the better. Under any circumstances trimming is a serious setback to the plant. Large suckers about to flower, removed from the parent plant during warm, moist summer

weather and planted almost at once without trimming the leaves at all, have been known to produce good fruit. Had they been trimmed, the fruit would have been too small to market. When planting large suckers, it is rarely possible to avoid all plants about to flower, but if these are not trimmed they will probably produce marketable fruit.

Storing of Plants.

If necessary, plants may be stored for several months, but they deteriorate steadily by exhausting their reserves of carbohydrate. They should be stored in single layers, base up, in the shade during dry months but in the open during the wet months of summer.

Plate 26.
A YEAR-OLD PLANTING OF TOPS, SHOWN MEETING IN THE 4-FEET INTER-ROW.

PLANTING DEPTH.

It is not desirable to plant deeply and three inches is generally sufficient, with four to five inches for large suckers. Plants set deeply rarely thrive but develop bunched, narrow growth. The usual method of planting is with a small hoe. Some growers run a furrow, place the plant in the drill, and fill in with a subsequent furrow. This is quick, but it is difficult to keep an even depth of planting. Also, many plants may have earth thrown into their centre leaves, and this gives them a serious setback.

While deep planting is to be avoided, it is difficult to plant small winter tops deeply enough. In such cases it may help to run a small furrow not more than two inches deep. The tops can be planted one-and-a-half inches deep in the bottom of this drill, and when they have

grown bigger the drill can be chipped in. The plants will then be at the correct depth. On no account, however, should a small top be planted so that its heart is submerged.

PLANTING DISTANCES.

The usual method of planting (Plate 26) is in double rows two feet apart with the centres of each pair of double rows six to seven feet apart and the plants at one-foot intervals in the rows. The closer spacing gives about 14,000 plants per acre.

On comparatively poor land and on replant land, the 6-feet spacing of the double row centres is generally sufficient, but on very fertile land where growth is vigorous it may be necessary to adopt a 7-feet spacing. With the wider spacing it is possible to plant a single row of large plants down the centre of the 5-feet inter-row, this row to be removed after it has matured its first crop.

Some growers prefer to plant in single rows about five feet apart, believing that this makes for easier weed control. However, this advantage is offset by the greatly reduced number of plants per acre and hence lower yield.

In general, close planting plays a large part in conserving moisture. As the pineapple plant itself uses little moisture in comparison with most other plants, much of the moisture lost from a plantation is either through weed growth or by evaporation from the surface of the soil. With close planting the ground is shaded and air movement lessened, and thus the losses by evaporation are greatly reduced. Like a mulch, close planting brings about a moist condition in the better aerated and more fertile surface soil, and this is the zone in which the pineapple roots can best thrive. Close planting also tends to retard weed growth, thus further reducing moisture loss from the soil.

PLANTING TIME.

It is best to plant medium to large slips and suckers in readiness for flowering the following spring. August is a particularly good month to plant. Though growth will not commence until September, the plants will be ready to root with the first spring storms.

Other plants should be planted so that they may be sufficiently well grown to flower for the first possible summer crop. Some reference has been made to this in the description of planting material, and will be mentioned again when control of cropping is being discussed.

In the main pineapple growing areas of southern Queensland, some planting goes on throughout the summer and also in the latter half of March and throughout April, when the bulk of the summer crop has been picked. For summer tops, and for medium to small slips and suckers, this autumn planting ensures that the plants will be at the right stage for maturing a summer crop nearly two years after the time of planting. This practice has its disadvantages, however, in that handling the summer crop together with the rainy weather of this period makes it difficult to prepare the land. Also, rainy autumn weather after planting may cause considerable loss of plants from fungal rots.

In parts of northern Queensland where irrigation is not available, some growers prefer to leave their planting until about December, as

the very dry weather of spring and early summer does not favour early planting. Even with such late planting, the winters are so mild that it is possible to have plants sufficiently developed to flower in the following spring.

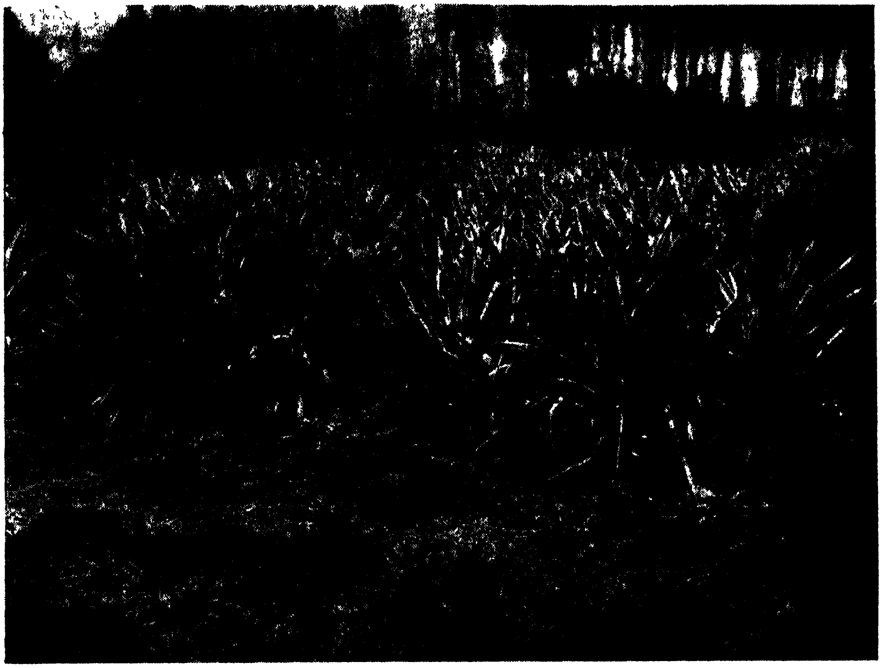


Plate 27.
A PLANTING 10 YEARS OLD AND STILL PRODUCTIVE. THIS IS NOT THE RULE.

PLANTATION MANAGEMENT.

Plantation Planning.

To maintain even production, it is necessary to plant about the same area each year. It is generally considered that, with a little help at peak periods, one man can handle about five acres of land. Ideally, this area should consist of five plantings each of one acre, ranging from the youngest area, not yet producing, to the oldest area, from four to five years old. With eight acres of land suitable for pineapples, it should be possible to maintain such a programme, providing for an intercycle period of up to two years and allowing for some extension of the life of any planting which maintains its productivity beyond the usual period of about five years.

To give some idea of the production which can be obtained from such a plantation, an instance can be cited where a grower who maintained an area of about five acres averaged about 2,400 cases per year over a period of six years. Furthermore, most of his land had been in production for many years. While this is well above the average, it is considered that land suitable for pineapples should, under good management, average not less than 400 cases per year for each acre in production.

The Crop Cycle.

While plantations have been kept growing continuously without replanting for as long as 50 years, it is now generally considered that the second ratoon crop marks the end of the economic life of the average planting. This gives a period of from five to six years from planting. There are some areas of more fertile soil, where plants may be allowed to ratoon longer (see Plate 27), the quantity and quality of the fruit being the best guide; but, in general, the decrease in the amount of fruit, and its decline in size, together with the difficulty of harvesting, make plantations unprofitable after this time.

Weed Control.

Weeds in the plantation are generally controlled by hand cultivation, using the Dutch hoe and sometimes the chipping hoe. Some growers who have fairly level land use rotary hoes, or even horse-drawn implements such as scufflers; but such cultivation must be kept very shallow and done very carefully, otherwise considerable injury to the roots will result. This is particularly harmful if it occurs in the cooler months of autumn and winter after root growth has ceased, as the plant will then have insufficient roots to carry it through the dry months of early spring. Another objection to the use of the rotary hoe for weed control is that the fine tilth it produces increases the risk of erosion.

Whatever implement is used, great care must be taken to avoid injury to the stem of the plant.

Weeds compete with the plant for soil moisture, and as they can also compete strongly with young plants for light young areas should be kept very free from weeds. If young and mature plantings are both in need of cultivation, the young plants should always receive priority.

By chipping weeds while they are small, less work is necessary and, if weeds are controlled thoroughly in this way during the early life of the plantation, subsequent weeding costs are reduced.

It is well to remember that plants taken from neglected and overgrown areas will introduce a large number of weed seeds. Generally it is an unsound practice to let an old area go to weeds before removing the plants; not only will the plants be the worse for this treatment and covered with weed seed as well, but the replant area will also be heavily seeded with weeds. With such an area it is best to remove all possible fruit and plants before the plantation has deteriorated too far, and then promptly turn in the remaining plant matter. A cover crop should then be planted to forestall the weeds. Weeds are particularly difficult to control in replant land, but much can be done in this respect during the preparation of the land. Paper mulch has also been used to help control weeds, and to conserve moisture, but it is rather costly.

In many ways, a mulch of grass and weeds appears to be superior to paper mulch, as it allows the entry of rain water and ensures a freer exchange of gases in the soil. It gives lower surface temperatures in summer, encourages surface rooting, and, on decomposition, is a valuable addition to the soil. To supply this mulch, it would probably be a sound proposition to bring in material like blady and other grasses and even light brush from outside and possibly also to grow material such as Sudan grass for the purpose.

Even if it is not possible to mulch the whole area, the grower might well mulch the area in the double row, as well as a strip of about nine inches just outside the plants. The labour involved in mulching is considerably offset by the reduction in chipping, and it must be remembered that mulching reduces erosion while chipping tends to increase it.

To be fully effective, mulch must be applied heavily, at least four inches deep. While a light mulch does conserve moisture and reduce erosion, it actually increases weed growth. Another point is that mulching with old grass and weeds may at times cause some competition for nitrogen. However, this can easily be remedied by applying extra sulphate of ammonia if the plants appear to be losing colour. If there is much likelihood of frost the ground should not be mulched, as this increases the risk of frost injury, but, of course, it is not advisable to grow pineapples at all in such circumstances. Mulching also increases the risk of fire, but this danger is always present in older plantings even without mulch.

Altogether weed control looms very large in production costs, and the position is aggravated by the fact that normal control measures fail during protracted periods of wet weather. If young weeds could be controlled at such time, possibly with flame or with selective weedicides, a great benefit would be conferred on the industry.

Hilling Up.

Where plants have suckered high, it often helps to plough a deep furrow down the inter-row and to shovel soil up to the plants. This tends to support the plants, which might otherwise collapse when fruiting. It also induces new roots above the old root system. This is particularly useful where plants are likely to wilt some months after roots have been killed by excessive rains. Such ploughing should be done during warm growing weather, and preferably while the soil is moist enough for the plants to make new root growth rapidly. The development of new roots may be helped considerably by stripping away a few of the lowest leaves before the hilling up is commenced. The need for hilling up is due to previous neglect, as high suckering is the result of failure to control flowering, and inadequate drainage is the chief cause of wilt.

Patching Up.

In many vigorous plantations, small areas of weakness develop, due possibly to some high-suckering plant falling over, or to a few plants wilting or dying from some other cause. Such patches are unproductive, and it is often possible to replant them with large suckers. For this purpose, suckers which have developed too high on the parent plant can be used.

When plants have fallen over they may be helped to produce both fruit and suckers by putting a small amount of earth on the base of the prostrate plant. A little mulch of grass or weeds, too, will help to provide good conditions for rooting and will reduce the harmful effects of exposure.

Fertilizing.

Except on the most fertile soils, pineapples benefit by large applications of artificial fertilizer, as much as one ton per acre being

applied yearly. The fertilizer for pineapples should have a relatively high content of nitrogen and potash, while the level of phosphate should be comparatively low.

In order that the plant may have a continuous supply of fertilizer during the growing season, when it can best be utilized, the fertilizer should be applied during the spring, summer and autumn months. The annual quota should be divided into several applications. If it is applied in a single dressing much may be lost by leaching, or be locked up, temporarily, by chemical or bacterial action in the soil, and thus not be available when required by the plant.

While the condition of the plant is a useful indication of its fertilizer requirements, it is not wise to delay fertilizing until pronounced deficiency symptoms are apparent. Fertilizing should be a routine practice as soon as the plants are established. The following table gives a guide to a suitable programme.

Period	Fertilizer	lb. per 1,000 Plants
September	10-6-10	50
November	Sulphate of ammonia	30
January-February	10-6-10	50
March-April	Sulphate of ammonia	30

The fertilizer is applied by hand, and with a little practice the grower should be able to judge how many plants can be treated with each handful. Fifty pounds per 1,000 plants is roughly equivalent to a handful to three plants. The fertilizer should be thrown into the base leaves or on to the base of the plants, as this allows water running down the leaves after the lightest showers to carry it into the soil. It is not necessary to wait for rainy weather before fertilizing. Fertilizer should not be thrown on the younger leaves of the plant, as it will burn them severely.

In fertilizing ratoon patches, it must be remembered that there are many more plants per acre, and that the area will consequently require more fertilizer.

Young plants well supplied with nitrogen should appear predominantly bluish-green in colour, with only a dull purplish-red at the centre of the leaf. As the plants mature they become greener, and the reddish colour becomes more pronounced with the approach of the flowering stage. This is a natural change; but should the green turn towards yellow and the red become too vivid at any stage of plant development, this is an indication that the plant requires nitrogen.

However, the response in growth and colour which so often follows the application of nitrogen as sulphate of ammonia should not be taken to indicate that this is the only fertilizer required. A correct balance of nutrients is needed, for, if the plant receives excessive nitrogen before flowering, the fruit tends to develop abnormal growth, with double, multiple and often fasciated crowns.

Trace Element Deficiencies.

While good growth can generally be obtained by adding the three main fertilizer constituents, the plant requires several other minerals in lesser amounts, some in very minute amounts. Most soils are

adequately supplied with these minerals, but occasionally one or more of them is either lacking or unavailable owing to some special soil condition.

"Crook Neck."—In some of the sandy coastal soils, young plants develop a peculiar disorder. The leaves turn a waxy greenish-yellow colour and bunch together. Frequently these bunched central leaves are bent almost to the ground, giving to the condition the name "crook neck." This disorder can be cured by applying copper sulphate and zinc sulphate incorporated in the 10-6-10 fertilizer mixtures at the rate of about 56 lb. of each to each ton of the complete mixture.

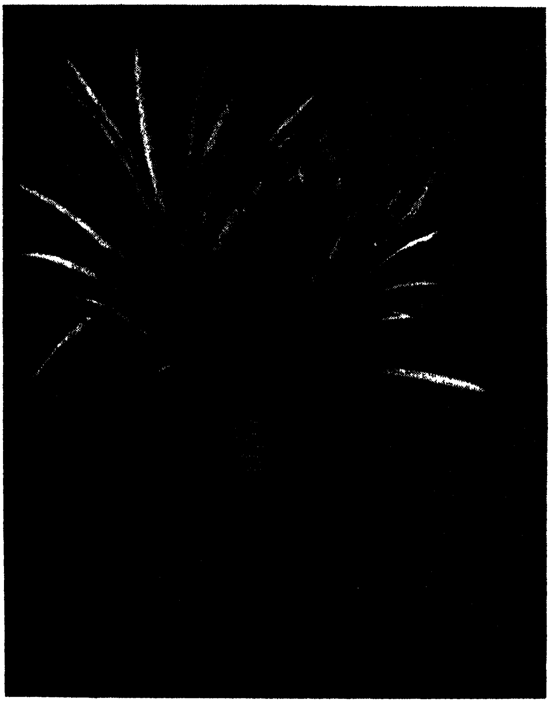


Plate 28.

A "Hold-over" Plant, Tall as the Result of Delayed Fruiting.—Note the great development of slips and the high suckers, many of which will collapse on fruiting.

Iron Deficiency.—Iron, a mineral essential to the green colouring matter of the leaves, is an example of trace minerals which are not available to the plant because of special soil conditions. Sometimes on red basaltic soils plants turn yellow, and it has been found that this is due to a deficiency of iron, brought about by the presence of excess manganese. The condition can be corrected by applying a 3 per cent. solution of sulphate of iron in water, as a mist spray over the leaves. A pound of iron sulphate to a 3½-gallon knapsack spray gives this strength. Care should be taken to secure a fine mist spray, which is applied at a walking pace. A mist spray gives a better cover than a coarser spray and reduces the risk of burning, which occurs if the

spray coalesces into drops and runs down the leaf. Applications should be made at intervals of about four weeks during the summer months, and six to eight weeks during the cooler months. It is, however, best to be guided by the colour of the plants and to make sure that no serious loss of colour occurs.

The same yellow or chlorotic condition due to lack of iron can be caused also by heavy liming.

CONTROL OF FRUITING BY THE USE OF ACETYLENE.

In describing the cropping habit of the pineapple, it has been pointed out that there are two main cropping periods—February-March and August-October—with a comparatively light crop being produced throughout the rest of the year.

The type of fruit matured during the midsummer and autumn months is superior to that produced in winter and the sucker growth is also better. Furthermore, serious physiological disorders of the fruit such as black heart are likely to develop in the winter crop. It is better, therefore, to have plant crops fruiting uniformly for the summer crop. Winter requirements of fresh fruit will naturally be supplied by the ratoon crops.

Uniform summer plant crops are not, however, the rule. Often, though the plants are quite well grown, only 30–50 per cent. of them flower during September. The remainder may not flower till the following autumn and spring (this is known as "holding over;" see Plate 28), and will then be very large with high suckers. This is a serious defect and generally leads to a collapse of the area. Also, the delay in fruiting is a distinct loss, and the uneven fruiting complicates cultural operations.

It is fortunate that, in the use of acetylene, the grower has at his disposal a simple means of controlling flowering. By the end of September, most plants which are going to flower in the spring period will have done so. Those that have not, provided they are large enough to carry good fruit, can be treated with acetylene during October, when they will flower in six to eight weeks' time and mature their fruit during late April and May. If necessary, the crop can be spread to some extent by treating different sections at intervals of a week or a fortnight. Also, the gap between the main summer crop and that produced by the acetylene treatment may be reduced by treating the whole patch early in September, even though it may not then be possible to tell what plants will flower naturally.

Acetylene may be applied either as granules of calcium carbide or dissolved in water. Small granules of the ordinary carbide of commerce may be dropped into the heart of the plant, where they will liberate acetylene. Alternatively, a solution of acetylene may be prepared by throwing a medium handful of carbide into a 4-gallon tin of water. When the carbide has nearly stopped bubbling, the plants can be treated by pouring about one-third of a cupful of the solution into the heart of each. It is generally considered that this is the more effective treatment. Whichever method is used, however, it is advisable to repeat the application if heavy rain falls within 24 hours, though falls of 20 points within 12 hours have, on occasions, had little effect. Acetylene may be used to regulate the cropping of the ratoon areas, but, owing to the

variation in the size and age of the suckers, it will not be possible to obtain a complete ratoon crop in one season. It is especially useful, too, in getting all available fruit from an area which is to be turned in. Another use, very important to the small grower, is the spreading of the crop in such a way as to avoid peak crops and the extra labour these entail.

Acetylene may be applied in February and March to bring in a crop in November and December, but unless the locality is warm and sheltered and generally favourable this is not advisable. When fruit matures naturally in November and December, a large percentage is of poor type, misshapen and cracked owing to unfavourable growing conditions, and it is not wise to expose more fruit to these conditions by using acetylene. It is also unwise to treat plants which are too small to bear a good-sized fruit. Acetylene can make a small plant flower, but it cannot make it bear a large fruit.

When used judiciously, however, acetylene is invaluable in regulating fruiting, spreading the crop and controlling plant growth, and it could be used more widely with advantage. In addition to acetylene, plant stimulants of the hormone type are being tested and they promise to give even greater control of flowering and fruit development. Experiments have indicated that alpha-naphthalene-acetic acid, one of these chemicals, is very effective in inducing flowering, even at the very low concentrations of about one-sixth of an ounce in 200 gallons of water. However, double this strength is recommended until further information is available. The above amount is enough to treat about 20,000 plants, using about one cupful of solution to six plants; at the higher concentration the cost for chemicals is not more than 10s. per acre.

HANDLING THE CROP.

The fruit is harvested when it is beginning to ripen, the stage at which the fruit is picked varying with the season and the distance of the plantation from available markets. The right stage at which fruit should be picked is indicated by the shape of the fruit and by changes in colour. As the fruit begins to ripen, a yellow colour develops at the centre of the lower eyes, then in the whole eye, and eventually extends towards the top of the fruit. External changes associated with ripening of the pulp differ from locality to locality and vary with the season and the age of the plantation. During the summer, fruit is often quite ripe when the external colour is only slightly yellow at the centre of the basal eyes, while in winter fruit is not ready to be picked until it is half-coloured. However, even for the most distant markets summer fruit should not be picked until definite signs of yellowing appear at the base, and in the winter the fruit should always be allowed to remain on the plant until it is half-coloured.

During the wet summer months, a great deal of fruit is lost from soft rots which occur during transport and storage. The chief cause of this rotting is fungal infection by the water blister organism, which

enters the fruit either through injuries caused by careless handling or through the base of the core where the stalk has been snapped off. These losses can be almost entirely prevented by keeping the shed clean, by careful handling and by cutting the fruit stalk instead of snapping it.

Fruit should be cut from the stalk and carried in a basket to the nearest road or headland. Whatever method is used to carry it to the packing shed, great care should be taken to prevent jolting or bruising.

As the water blister fungus develops on rotting pineapple waste, old fruit and heaps of tops, no such refuse should be allowed to remain either in or near the packing shed, and the shed should be periodically disinfected by spraying out with a 5 per cent. solution of formalin. Slides or other vehicles used to carry in the fruit should also be sprayed occasionally.

If the fruit is picked during hot weather it is an advantage either to pick it in the morning or to let it stand in the shed for a time, preferably overnight, before packing and consigning it to a distant market. Also, if it is picked during wet weather it should be stood on its crown and allowed to dry as much as possible before it is packed for the fresh fruit trade.

All fruit should be carefully graded, but fruit for the fresh fruit trade needs to be packed more carefully than is the case with canning fruit. The former is packed "tops on" with woodwool padding, while the canning fruit is packed without the tops and without woodwool.

The importance of handling the crop carefully has been stressed, as neglect in this direction may undo much of the work that has gone into the plantation. A little extra care will avoid this and will result in a higher price for a sound and attractive article.

RED SPIDER IN STRAWBERRIES.

Red spider infestation of strawberry crops is rather severe this year and threatens to reduce the bearing life of many plantings. Control measures for this pest of strawberries require careful attention during the whole growing period, for once the pest gets out of hand it is difficult to clean up the infestation. Dusting with sulphur at fortnightly intervals up to flowering and occasionally after heavy fruit picking during the cropping season is normally satisfactory. However, when control measures have either not been applied before harvesting commences or have failed to give the required degree of control, it is necessary to pick the crop heavily and then immediately apply a sulphur dust. Provided the plants are irrigated with overhead sprays before the next picking day, residues should be negligible and reasonable red spider control will be obtained. An alternative to sulphur dust is a hexaethyl tetraphosphate spray which is marketed under the name "Hexone." This spray is used at a concentration of 1-1200 but it is essential to treat the plants thoroughly in order to ensure that the leaf surfaces where the mites occur are completely wetted.

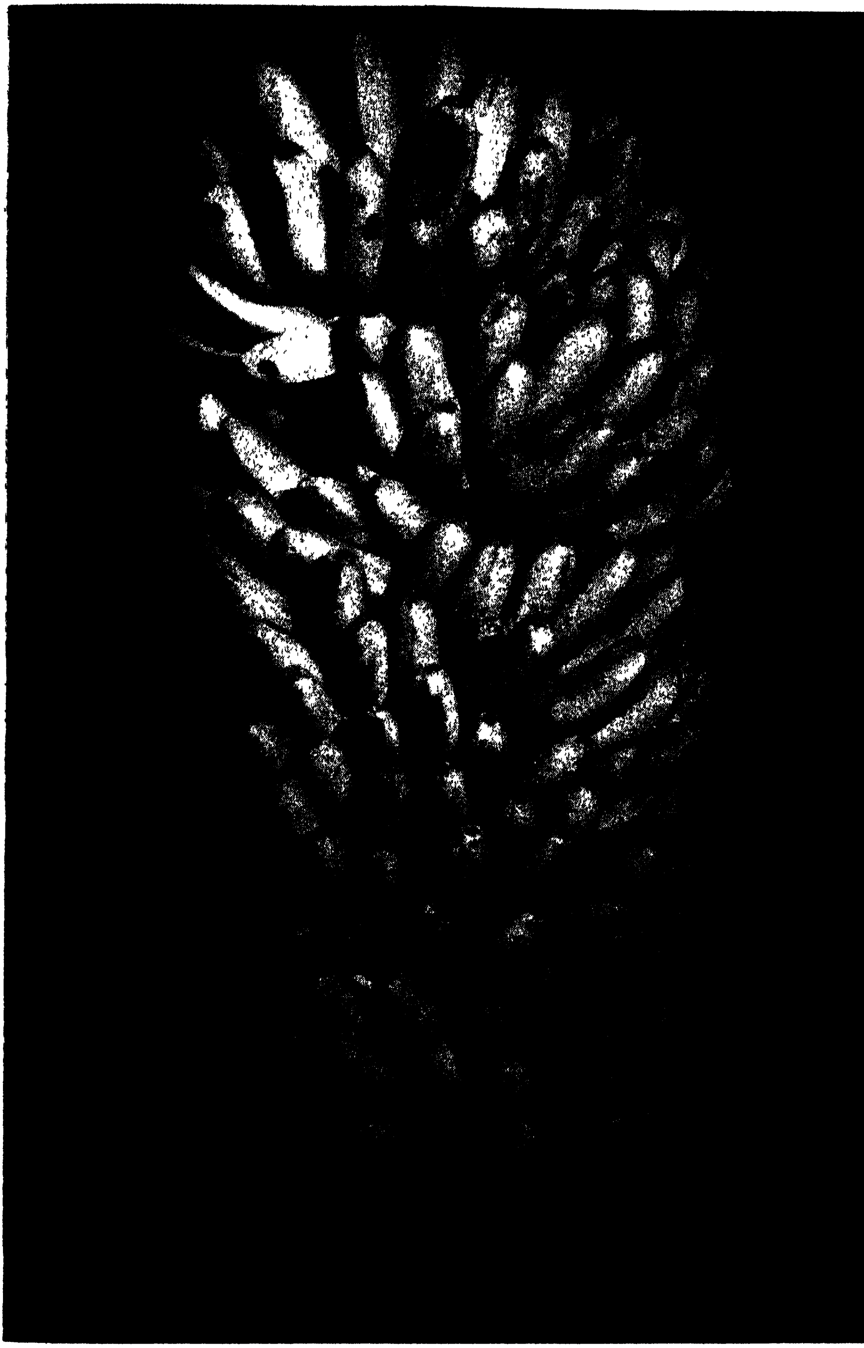
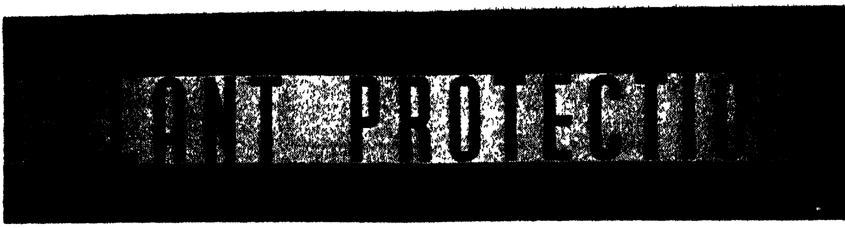


Plate 29.

Record Bunch (Approximately 20 Dozen) of Bananas Grown in Queensland.—Type: "William Hybrid;" weight: 132¾ lb.; grown by George Chester, Pimpama. The massive bunch was presented to the Montrose Home for Crippled Children.



Crinkle Virus Disease of Strawberry.

T. McKNIGHT, Pathologist, Science Branch.

IN the main strawberry production areas of Queensland last year the effects of "crinkle" virus disease were severe enough to arouse the concern of growers. The disease was present in varying degrees in all commercial plantings inspected and occurred occasionally in epidemic proportions.

Overseas and in other parts of the Commonwealth the degeneration or "running out" of certain strawberry varieties has been traced to the gradual building up of worthless virus infected stock. It behoves growers to recognise the importance of the strawberry virus diseases, to familiarize themselves with the symptoms they produce and to put into operation the measures recommended to assist in the building up of high grade planting material.

As with many other virus diseases, the danger with strawberry crinkle disease lies in the fact that affected plants are not killed outright

Plate 30.

CRINKLE-INFECTED PLANT, SHOWING PUCKERED AND MOTTLED LEAVES.

and they may continue to yield to some extent. A very real decline in the quality of planting material commences when crinkle infected plants are allowed to remain in position after the runner beds are established.

Unlike the strawberry "yellow-edge" virus, which shows its symptoms in winter, the crinkle virus is most readily identified in the warmer months, and last season the virus was readily recognised in commercial plantings between the months of September and January.

Plate 31.

YOUNG INFECTED LEAVES SHOWING SMALL CLEAR SPOTS.

Symptoms of the Disease.

A strawberry plant in an advanced stage of infection with crinkle virus is a dwarfed plant readily detected from its healthy neighbours. The plant has a flat, bunchy type of growth with crinkling and puckering of the younger leaves, on which occur yellowish areas of irregular shape (Plate 30). Occasionally these yellowish areas form conspicuous bands or sectors running from the margin of the leaf along a vein towards the main vein. If the youngest leaves on such a plant are held up to the sun small clear pinpoint spots will be noted and some of these will have a brown dead centre (Plate 31). Most of the mottled leaves do not have the normal flat leaf blade but tend to be cupped upward or arched downward, and exhibit an irregular waving of the leaf margin. In the earlier stages of infection the symptoms are not so obvious, but a careful examination of a suspicious looking plant will reveal that the leaves have not a good uniform green colour or a smooth leaf surface, and the young developing leaves will show the small clear spots mentioned above.

Method of Spread.

This disease is inherited. When a mother plant is infected with the crinkle virus all of the runner plants derived from it will be similarly infected. The disease is also spread from plant to plant by the commonly occurring strawberry aphid, which becomes infective after feeding on a diseased plant. Unlike a number of well-known virus diseases, crinkle is not spread mechanically during picking and cultural operations.

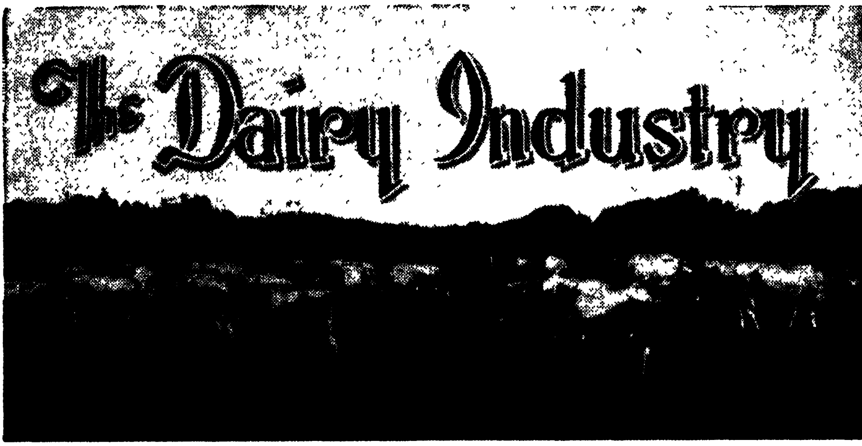
Control.

Once a plant is infected with the crinkle virus there is no cure. With a knowledge of the methods by which the disease is spread, measures for control are aimed firstly at the elimination of the disease from planting material, and secondly at the prevention of spread by the strawberry aphid.

The selection of healthy runners is the most important measure. This should be commenced by frequent inspections of the beds, starting in August and maintained until the runner beds are established, so that infected plants can be removed immediately they are detected. As it is sometimes difficult to make a definite diagnosis of crinkle disease in the earliest stages of infection, the policy of the grower whose aim is the establishment of a high-grade foundation stock should be to rogue all abnormal plants over the whole of the growing season in order to cull also yellow-edge plants occurring during the cooler months.

The need for a careful check on the strawberry aphid is obvious. With a high population of the aphids and an occasional diseased plant missed during the inspections, a quick spread of the virus can be expected. Nicotine sulphate (1:800 spray or 3 per cent. dust), Hexone (1:1600 spray) or a BHC product such as "Gammexane" (2 per cent. dust) control the aphid reasonably well. The aphids tend to stay on the lower leaves of the plant near the ground and thorough application of the spray or dust is therefore required in order to get a good kill. Treatment is normally required at fortnightly intervals during the growing season. Monthly treatment of the runner beds is also desirable.

Plate 32.
A WEIR ACROSS THE LOCKYER.



The Side-gate Bail.

A. F. MOODIE, Division of Dairying.

A DEVELOPMENT which has gained much favour in the central dairying districts is the side-gate bail with lever-action control incorporated in the approved combined dairy building.

The accompanying sketches and plates illustrate both the design of the gate and the way in which it is used.

The advantage of this type of bail include—

1. Gates, not doors, are used.
2. The gates swing sideways, not into the race, leaving the race free of obstructions.

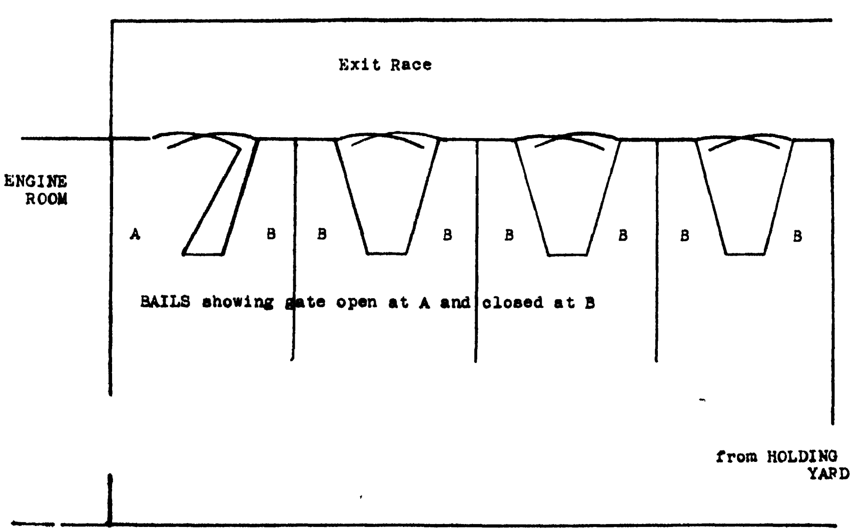


Plate 33.

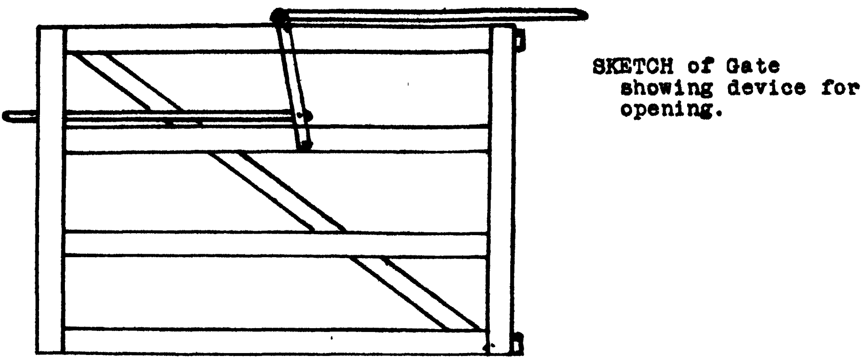


Plate 34.

3. As the gates are of open design, the race is under continuous observation.
4. With the gate at the side of the cow's head and not in front of her, there is little tendency for her to push through.
5. Cleaning of the shed is simplified.
6. The gate is easily operated by the lever shown in the sketch.

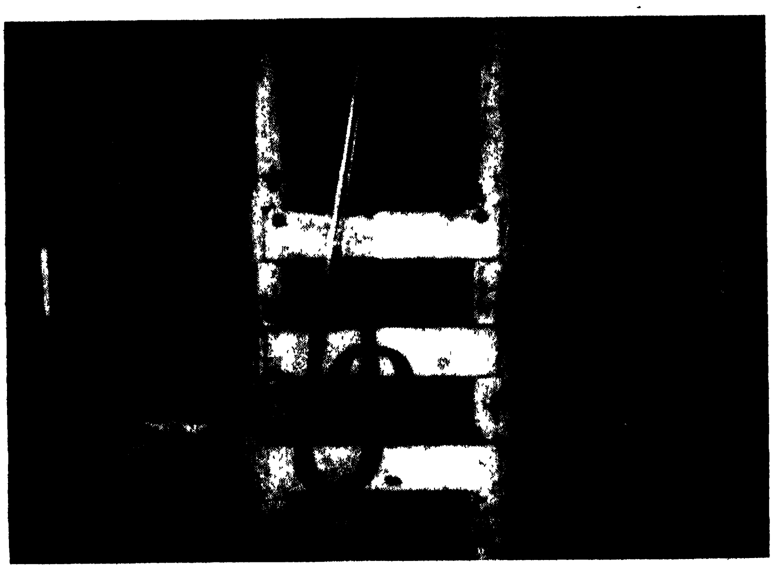


Plate 35.

THE SIDE-GATE BAIL, WITH THE GATE CLOSED.

Plate 36.
THE SIDE-GATE BAIL, WITH THE GATE OPEN.

MAKE SURE THE SEPARATOR IS CLEAN.

Towards the end of the season and during the winter there is a tendency to slackness on a few farms in the attention given to the separator. This is probably due to the smaller quantities of milk being separated and to the shorter days, resulting in the separator not being washed after the evening skimming, or at best flushed out with cold water without being dismantled.

Periodical investigations in checking faulty cream supplies disclose that the carelessly washed separator is a frequent cause of inferior cream. Often the evening cream delivered to the factory will be of choice grade while the morning cream from the same farms will be graded as inferior. This is due to the evening cream coming from a clean separator washed during the day, and the morning cream from a separator that had not been properly washed the previous evening.

Apart from the risk of contamination, the loss of cream in the skimming may be three times greater than when a clean machine is used, because of the clogging of the discs.

The washing of the separator is not a great burden if a plentiful supply of boiling water is available and the work is done immediately separating is over before the milk dries on the parts.

The Beef Cattle Industry in the Far West.

J. C. J. MAUNDER, Chief Inspector of Stock.

(*Continued from page 22, July, 1948.*)

HERD MANAGEMENT.

Breeds of Cattle.

The Shorthorn holds undisputed sway throughout the entire area—no other breeds, or combination of breeds, are to be seen on any holding. Preference is shown towards the polled Shorthorn, due no doubt to the fact that every precaution has to be taken to minimise bruising of fats in transit to the far-distant meatworks. The Shorthorn, both polled and horned, has been found to be the most suitable for the large unfenced holdings where the very minimum of handling is practised. They appear to be the only cattle that will remain quiet under these conditions. Other breeds tend to become very wild, making them extremely difficult to muster and to drive.

Breeding Practices.

There are no stud cattle in the area, but herd bulls are purchased from outside studs, some in Central Queensland, some in New South Wales.

Those properties that depend primarily on store fattening do not run any herd bulls. On these properties, such propagation of the species as does occur is dependent upon the activities of "mickies" or male calves that have been missed in the previous musters. Incidentally, these "mickies" get some very fine calves.

All properties practise spaying, though it may not be done every year. The general principle is to spay out when the number of breeders on a property is considered to be too large for safety. It is amongst

the breeders that losses are heavy in drought times. Spaying is usually done "in a face" and there is practically no classing or culling. Cows and heifers are simply mustered, yarded and spayed out. It is decided that there are, say, 2,500 breeders on a property that should carry 1,000; therefore mustering and spaying progresses until 1,500 have been spayed out.

This practice applies particularly to those properties that are regarded primarily as bullock depots for fattening. On those properties where breeding is more extensive, spaying is practised with more regard to age and quality. The spaying is done by a contractor, who lives on the camp with the manager and stockmen until the job is completed; it takes about a week to spay out 1,500 head.

Plate 37.

FLANK SPAYING.—This method is practised on the smaller heifers where passage spaying would be difficult and slow. There is practically no difference in the time taken to perform the two operations. The disadvantage of flank spaying, of course, is the open wound, which is treated with the time-honoured tar-stick.

Passage spaying is performed for preference, but flank spaying is used on all females not sufficiently developed for the passage operation to be performed. Both methods are satisfactory when performed by a skilled, careful and fast operator (Plate 37).

Store Fattening and Breeding.

It is generally agreed that the most profitable part of the cattle industry is fattening, and therefore, most people prefer to fatten on country that will fatten. There is natural reluctance to breed cattle and sell them as stores for somebody else to benefit from the more profitable practice of fattening, when fats can be turned off.

In the Georgina-Diamantina country, the basic practice is to purchase stores and bring them in to turn off as fats. The exception

is with one large landholding company, which holds a string of properties along the Georgina and Diamantina, Farrars Creek and Coopers Creek into New South Wales and South Australia. In this case, no stores are brought into the Georgina and Diamantina holdings; what fats are marketed from those properties are bred there. Many stores move off these places, not for sale, but for movement through to the other properties en route to the ultimate market as fats. Advantage is thereby taken of variation of seasonal conditions in the different areas.

Plate 38.

MIXED CATTLE ON A GEORGINA PROPERTY.—Note the roan heifer in the foreground—a nice sample of baby beef. The cattle are walking out from water in the early afternoon, will probably return the following morning, camp and feed by the water and walk out again during the afternoon. As the summer comes on, cattle tend to camp all day by the waterholes, walk out to feed at dusk and return early again the following morning.

However, it is necessary to run some breeders on all properties with which the newly introduced stores can mix and settle down. In addition, in some years, owing to price and seasonal fluctuations it is not possible to get stores in. If no breeders were run, the turn-off of fats would be small in some circumstances. Running breeders and bringing in stores provides a double source of supply of fats—a necessary safeguard in a country where it is courting disaster to be completely tied to a single policy.

Introduced stores are brought almost exclusively from the Northern Territory. One pastoral company controlling three properties in the area also has a large run in the Territory where all its stores are bred. Another company has no holdings in the Territory but buys stores there whenever they are available and the prices and seasons are right. Most stores originate from Alexandria, Brunette, Austral Downs and Avon Downs, with some from Headingly.

Stores usually come in at 1½–2 years old, starting on the road in April–June and taking 6–10 weeks to reach their destination. With good seasons they may be got away as fats about July–August of the following year, but as a rule it takes two seasons after arrival to turn them off as fats.

These store fattening properties each bring in from 2,000 to 5,000 stores in a suitable season. A property which would bring in 4,000–5,000 stores would expect to turn off an average of 3,000 fats per annum in ordinary seasons.

Cattle Routines.

As pointed out previously, the runs are unfenced and cattle run almost at will, following the feed and water in accordance with the seasons. All classes—cows and calves, heifers, steers and bullocks—run together (Plate 38).

One general muster is held each year. This is done in sections, mustering through the run methodically. Practically all branding, earmarking and castration are performed in the broncho yards that are situated throughout the run. These general musters are attended by representatives from adjoining properties to claim any of their cattle and to earmark and brand their calves. Owing to the non-existence of boundary fences on most holdings, it is not uncommon for one adjoining holding to claim 1,500 head.

Mustering for fats is usually timed so that the fats go off during July and August. This is again a systematic muster, small mobs being put together and the fats cut out and moved along in the direction of the muster. The mobs have to be watched in camp at night, there being no yards for holding. On those occasions where broncho yards are used to hold small mobs, it seems to be the inevitable fate of the fences to be flattened and the mob to disperse.

The fats are not mustered into a bullock paddock, but are gradually made up into the average consignment of 500 and turned over to the drover for immediate movement towards railhead. Actually, in some cases the drover and his plant join up with the mustering camp and assist in putting the fats together and then finally move them off; this practice has much to commend it.

After all the fats have been cut out and started on the road, it may be necessary to start another muster to move off cows and calves to reduce stocking in anticipation of a dry period ahead. Follow-up of the general muster may take place if it is suspected that any considerable mob may have been missed during that operation. During all these musters, all the gear is transported from camp to camp by horse-pack and the job of horse-tailer is usually a full-time one.

Feeding Habits.

Beyond an attempt to save the feed around the permanent water as much as possible, little is done to control the feeding habits of the

cattle. In channel country while any lush feed such as native sorghum, clover, herbage, &c., is available, cattle naturally prefer to feed in the channels. As the feed dries off, they gradually move out on to the flood plains, existing then on the grassy feed. Should this fail, they finish up on the slopes of the sandhills, where they get a good picking of herbage and, as a final resort, dry spinifex.

In the open gravelly downs and plain country, cattle feed on the unsheltered plains and appear to fatten just as well as they do in the more sheltered sandhill country. In fact, cattle seem to fatten anywhere on whatever grows, provided the rate of stocking is kept down.

Drought Losses.

There is no doubt that over a period of years disastrous drought losses have occurred, and at least one herd of approximately 10,000 head has been completely wiped out twice in the last 30 years. Other herds, no doubt, have had similar experiences. Cattle numbers generally have declined over a period of 20 years. Some disastrous losses occurred as a result of the dry years of 1927, 1928, 1929, which followed a comparatively dry period from 1922–1927. Following these heavy losses, owners have been reluctant to stock as heavily as formerly.

The only safeguard against drought losses is obtained by regulation of the intake of stores, keeping down the number of breeders by spaying and the care and establishment of water facilities.

MARKETING OF CATTLE.

Fats Turned Off.

As mentioned previously, the main object of all owners is to market the maximum number of cattle as fats. The average number of fats that are turned off annually over a period of years is about 26,000 for the whole area. Although no annual figures are given, judging by the decline in cattle numbers from 1924 it is reasonable to assume that less fat cattle are turned off now than was the case 25 years ago.

Ages, Condition, &c.

Cattle bred on the Georgina and Diamantina, given just average seasons, make up into prime baby beef at 2–2½ years and would dress from 550–650 lb. In the best of seasons, they would dress up to 750 lb. Unfortunately, at this age, they would never walk the long distance to railhead (in some cases 450 miles) without excessive wastage to a weight at which killing would not be profitable. Occasionally in good seasons, with excellent feed along the stock routes, small numbers of these young steers may reach the market in good condition.

Stores usually come in at 18–24 months and require two seasons to turning off. Therefore, the earliest that station-bred cattle can be turned off is three years and Territory bullocks four years. Probably

the majority of bullocks are four to five years old before they reach the meatworks. The big seven-and eight-year-old bullocks that go to the works are usually those that have missed musters or have been kept back by the state of stock routes.

There is no doubting the quality of these bullocks and it is only the long trek to the treatment works that prevents their grading out at almost 100 per cent. first export quality.

Plate 39.

FATS ON THE LONG TREK.—Part of a mob of 600 fats from the Georgina. Mostly five and six-year-old bullocks, they have completed the first 100 miles of a 460 mile walk to Quilpie, thence by rail to the works at Tenterfield. It is expected these would average in the vicinity of 800 lb. dressed weight. On the walk in, this mob would average about seven to eight miles per day.

In good seasons, when the fats are prime and there is ample feed on the stock routes, there is very little wastage on the trip in, but in less favourable seasons when the cattle are fat, without being prime, and when the stock routes are bare the wastage would be considerable, in the vicinity of 12–15 per cent. or nearly 100 lb. per beast.

The older bullocks (five to six years) walk in much better than the younger and unfortunately it is often necessary to hold them on the property, not until they are fat but until old enough to walk in to the rail head (Plate 39).

Fat Cattle Markets.

Seasonal conditions and the state of stock routes to a certain extent determine the markets to which fats will be forwarded. The works to which fats may be sent are Townsville, Cannon Hill, Wallangarra, Tenterfield and Adelaide. Unlike the Cooper output, very few cattle go to the Bourke works.

Properties on the upper reaches of the Diamantina and Georgina prefer to truck at Winton or Butru for Townsville works. Those on the lower reaches truck at Quilpie for Tenterfield, Wallangarra or Cannon Hill, and, until recent years, some trucked at Maree for Adelaide. The Adelaide market has, until recent years, been ahead of Brisbane and the New South Wales works, especially for cow beef. This difference is no longer pronounced and, therefore, fats only go that way if stock route conditions are more favourable for them than those used for the other markets.

There are no recognised markets for store cattle, which are only sold as such when dry conditions are anticipated. These sales are usually made to buyers who take delivery on the property and walk the cattle to their own holdings for fattening.

Difficulties of Marketing.

The greatest single limiting factor to the actual productivity of the country, in terms of fats marketed, is the difficulty associated with transport to works. As pointed out previously, distances from railhead are excessive and limit the class of beast that can make the trip. Stock routes (fuller reference to which will be made later) are not well watered and are often bare of feed. In some cases, a route cannot be used because there is no water on it, and in other cases there is water but no feed. It is sometimes necessary to puddle holes in the watercourse where surface water had dried out and bail water for the cattle.

Some mobs of fats are fed with lucerne hay along a route which has water but no feed. It is estimated that this requires 10 lb. of lucerne hay per head per day, feeding about every third day; on a trip of approximately 250 miles, which would take about a month to six weeks to complete.

In seasons where good floods have occurred in the channels, with no local rains, it often happens that thousands of fat cattle are ready to go off but the bare stock routes are impassable. Such cattle then have to be carried another season with all its risks.

When seasons are good, with plenty of feed and water along the stock routes, a six weeks' walk in does not worry the fats unduly and wastage is very slight. If well cared for on the road, they feed all the way to trucks. The long walk, however, combined with the train journey that would be not less than 400 miles and may be up to 650 miles (over 1,000 miles to the works in some cases) must have some considerable effect on the quality and sappiness of the meat. It is generally recognised, however, that fat cattle from the channel country are firmer and travel much better with less wastage, mile for mile, than cattle from, say, North Queensland.

[TO BE CONTINUED.]

A Pig Breeding and Feeding Programme for the Dairy Farm.

F. BOSTOCK, Officer in Charge, Pig Branch.

WHERE pig production is largely dependent on the dairying activities of a farm, careful planning of production is necessary to ensure that the dairy by-product, skim milk, is used to the best advantage. The farmer should as far as possible avoid being caught with an insufficient number of pigs to cope with the flush of skim milk; on the other hand, he should not be caught with a large number of pigs on the farm when skim milk is in short supply.

The following table has been drawn up to assist farmers in planning their pig raising operations. It applies to a 30-cow dairy farm, but dairy farmers with fewer or more cows will be able to use it as a guide. By following such a programme in a normal season, the farmer can obviate the purchase of stores during the flush of milk production and the sale of unfinished pigs because of insufficient feed.

SUGGESTED BREEDING PLAN AND FOOD REQUIREMENTS OF PIGS ON A 30-COW HERD DAIRY FARM.

Month.	Stock.	Separated Milk.	Meat meal.	Grain.	Fodder Crops Grain Equivalent. (*See* Note at End.)	Suggested Crops when Available.
		Gal.	Lb.	Lb.	Lb.	
July	No. 1 sow farrowed 5th July ..	As available	1	5	Grazing Green feed cut	Wheat, barley, oats, rape, grazing lucerne as available
	No. 2 sow with litter		1¼	7		
	No. 3 sow dry		¼	2		
	No. 4 sow dry		¼	2		
	6 porkers from No. 3 sow ..		¼	4		
	6 slips from No. 4 sow		½	2		
	Daily Total		7¼	52		
	Total for 31 days		224¾	1,612		

SUGGESTED BREEDING PLAN AND FOOD REQUIREMENTS OF PIGS ON A 30-COW HERD DAIRY FARM.—*continued.*

Month.	Stock.	Separated Milk.	Meat meal.	Grain.	Fodder Crops Grain Equivalent. (*See* Note at End.)	Suggested Crops when Available.
		Gal.	Lb.	Lb.	Lb.	
August	No. 1 sow with litter	As available	1¼	7	Grazing Green feed cut	Wheat, barley, oats, rape, mangolds, grazing lucerne as available
	No. 2 sow mated 10th August ..		¼	2		
	No. 3 sow dry		¼	2		
	No. 4 sow dry		¼	2		
	6 weaners from No. 2 sow ..		½	1		
	6 light baconers from No. 3 sow ..		¼	5		
	6 porkers from No. 4 sow ..		¼	4		
	Daily Total		8	73		
	Total for 31 days		248	2,263		
September	No. 1 sow mated 10th September	..	¼	2	Grazing Green feed cut	Wheat, barley, oats, mangolds, grazing lucerne as available
	No. 2 sow dry	..	¼	2		
	No. 3 sow farrowed 5th September	1	½	5		
	No. 4 sow dry	..	¼	2		
	6 weaners from No. 1 sow ..	1	..	1		
	6 slips from No. 2 sow	1	..	2		
	6 baconers from No. 3 sow (sell) ..	1	..	6		
	6 light baconers from No. 4 sow ..	1	..	5		
	Daily Total	25	1¼	95		
	Total for 30 days	750	37½	2,850		
October	No. 1 sow dry	1	..	2	Grazing Green feed cut	Lucerne, mangolds, grazing lucerne as available
	No. 2 sow dry	1	..	2		
	No. 3 sow with litter	3	..	7		
	No. 4 sow farrowed 5th October ..	3	..	5		
	6 slips from No. 1 sow	1	..	2		
	6 porkers from No. 2 sow ..	1	..	4		
	6 baconers from No. 4 sow (sell) .	1	..	6		
	Daily Total	26	..	88		
	Total for 31 days	806	..	2,728		
November	No. 1 sow dry	1	..	1	4	Millet, sweet potatoes, grazing lucerne as available
	No. 2 sow dry	1	..	1	4	
	No. 3 sow mated 10th November	1	..	1	4	
	No. 4 sow with litter	3	..	5	8	
	6 porkers from No. 1 sow ..	2	..	2	8	
	6 light baconers from No. 2 sow ..	2	..	2	12	
	6 weaners from No. 3 sow.. ..	2	..	½	2	
	Daily Total	42	..	35	152	
	Total for 30 days	1,260	..	1,050	4,560	

Suggested Breeding Plan and Food Requirements of Pigs on a 30-cow Herd Dairy Farm.—*continued.*

Month.	Stock.	Separated Milk.	Meat meal.	Grain.	Fodder Crops Grain Equivalent. (*See* Note at End.)	Suggested Crops when Available.
		Gal.	Lb.	Lb.	Lb.	
December	No. 1 sow dry	1	. .	1	4	Millet, sweet potatoes, pumpkins, maize, cowpeas, grazing lucerne as available
	No. 2 sow farrowed 5th December	2	. .	3	8	
	No. 3 sow dry	1	. .	1	4	
	No. 4 sow mated 10th December . .	1	. .	1	4	
	6 light baconers from No. 1 sow . .	2	. .	2	12	
	6 baconers from No. 2 sow (sell) . .	2	.	3	12	
	6 slips from No. 3 sow	2	. .	1	4	
	6 weaners from No. 4 sow . .	2	. .	½	2	
	Daily Total	53	. .	45	200	
	Total for 31 days	1,643	. .	1,395	6,200	
January	No. 1 sow farrowed 5th January	2	.	2	8	Millet, sweet potatoes, pumpkins, maize, cowpeas, grazing lucerne as available
	No. 2 sow with litter	3	. .	5	8	
	No. 3 sow dry	1	. .	1	4	
	No. 4 sow dry	1	. .	1	4	
	6 baconers from No. 1 sow (sell) .	2	. .	3	12	
	6 porkers from No. 3 sow .	2	. .	2	8	
	6 slips from No. 4 sow	2	. .	1	4	
	Daily Total	43	. .	45	168	
	Total for 31 days	1,333	. .	1,395	5,208	
February	No. 1 sow with litter	3	. .	5	8	Millet, sweet potatoes, pumpkins, maize, cowpeas, grazing lucerne as available
	No. 2 sow mated 10th February . .	1	. .	1	4	
	No. 3 sow dry	1	. .	1	4	
	No. 4 sow dry	1	. .	1	4	
	6 weaners from No. 2 sow . .	2	. .	½	2	
	6 light baconers from No. 3 sow . .	2	. .	2	12	
	6 porkers from No. 4 sow . .	2	. .	2	8	
	Daily Total	42	. .	35	152	
	Total for 28 days	1,176	. .	980	4,256	
March	No. 1 sow mated 10th March . .	1	. .	1	4	Millet, sweet potatoes, pumpkins, maize, cowpeas, grazing lucerne as available
	No. 2 sow dry	1	. .	1	4	
	No. 3 sow farrowed 5th March . .	2	. .	3	8	
	No. 4 sow dry	1	. .	1	4	
	6 weaners from No. 1 sow . .	2	. .	½	2	
	6 slips from No. 2 sow	2	. .	1	4	
	6 baconers from No. 3 sow (sell) . .	1	. .	3	12	
	6 light baconers from No. 4 sow . .	1	. .	2	12	
	Daily Total	41	. .	45	200	
	Total for 31 days	1,271	. .	1,395	6.200	

SUGGESTED BREEDING PLAN AND FOOD REQUIREMENTS OF PIGS ON A 30-COW HERD DAIRY FARM.—*continued.*

Month.	Stock.	Separated Milk.	Meat meal.	Grain.	Fodder Crops Grain Equivalent. (See Note at End).	Suggested Crops when Available.
		Gal.	Lb.	Lb.	Lb.	
April	No. 1 sow dry	1	..	1	4	Sweet potatoes, pumpkins, maize, arrowroot, cowpeas, grazing lucerne as available
	No. 2 sow dry	1	..	1	4	
	No. 3 sow with litter	3	..	5	8	
	No. 4 sow farrowed 5th April	2	..	2	8	
	6 slips from No. 1 sow	2	..	1	4	
	6 porkers from No. 2 sow	1	..	2	8	
	6 baconers from No. 4 sow (sell)	1	..	3	12	
	Daily Total	31	..	45	168	
	Total for 30 days	930	..	1,350	5,040	
May	No. 1 sow dry	1	..	1	7	Pumpkins, maize, arrowroot, cowpeas, grazing lucerne as available
	No. 2 sow dry	1	..	1	7	
	No. 3 sow mated 10th May	1	..	1	7	
	No. 4 sow with litter	2	..	6	7	
	6 porkers from No. 1 sow (sell)	1	..	3	7	
	6 light baconers from No. 2 sow (sell)	1	..	4	7	
	6 weaners from No. 3 sow	1	..	1	..	
	Daily Total	23	..	57	112	
	Total for 31 days	713	..	1,767	3,472	
June	No. 1 sow dry	1	..	1	7	Pumpkins, arrowroot, rape, grazing lucerne as available
	No. 2 sow farrowed 5th June	2	..	4	7	
	No. 3 sow dry	1	..	1	7	
	No. 4 sow mated 10th June	1	..	1	7	
	6 slips from No. 3 sow	1	..	1	7	
	6 weaners from No. 4 sow	1	..	1	..	
	Daily Total	17	..	19	70	
	Total for 30 days	510	..	570	2,100	

NOTE.—Grain equivalent: 1 lb. grain = 4 lb. sweet potatoes; 5 lb. arrowroot; 7 lb. pumpkins; 10 lb. green forage.

NEW CLUBS.

The Director of the Junior Farmers' Organisation (Mr. T. L. Williams) reports progress in the formation of Clubs in several farming areas as a result of visits paid some time ago to the Wide Bay and Callide Valley districts.

JUNIOR FARMERS' SCHOOL.

A second short-term course of instruction for some 30 members of various Clubs is being held at the State Agricultural High School and College at Lawes from August 23rd to September 3rd inclusive, the lads selected coming from as far afield as Biloela and Mackay. Lectures and practical demonstrations will again be features of the "school," with films and radio broadcasts being freely used to illustrate the various forms of instruction being given. Officers of the Department of Agriculture and Stock will be assisted by Mr. Williams and members of the teaching staff at the College during the fortnight's currency of the course.

EXAMINATION RESULTS.

At the close of the last "school" of instruction, examination test papers were sent out to each member who had attended. The following are the winners in their respective age groups:—

Over 17 years: 1st and silver cup—John Brooks, Lilydale, via Helidon; 2nd—Gordon T. Reid, Willowvale, via Warwick, Denis B. Doyle, Clinton Vale, via Warwick, Reg. Blanck, Ravensbourne, T. A. Smoothy, Pinelands, via Crow's Nest, and Stanley T. Fowler, Pittsworth (equal); 3rd—Edward Chapman and Benjamin R. Walsh, Goombi, Western Line (equal); 4th—Gordon T. McLennan, Willowvale, via Warwick.

Under 17 years: 1st and silver cup—Frank A. Rowen, Pittsworth; 2nd—Leo. R. Jones, "Sellamah," Kilkivan; 3rd—William F. Stillburn, M.S. 1135, Goomeri; 4th—Reg. O. Madsen, Yangan, Wm. McConnell, "Ann Drummond," Millmerran, and John R. Wanka, M.S. 130, Pittsworth (equal).

Book prizes dealing with some agricultural subject will be awarded the second-, third-, and fourth-place competitors in each division. Mr. Williams said the competition had been well worthwhile, proving a helpful guide to a boy's practical knowledge of agriculture. In addition it had acted as an encouragement for observation and study on the part of each boy concerned, and revealed his eagerness to become as efficient as possible in the "art of farming."

ESSAY COMPETITION.

Competition essays on the subjects of "Soil Conservation" and the "Use of Trees on the Farm" are now being written. The results will be made known in a subsequent issue of the "*Journal.*"

SUMMER AGRICULTURAL SCHOOL FOR BOYS.

The Third Summer Agricultural School for boys attending State Primary and State Rural Schools will be held at the Queensland Agricultural and High School College from 3rd to 21st January, 1949.

The aim of the school is to make boys increasingly aware of their responsibilities and duties in living a more socially useful and healthful life in the home and community environment; to give training in leadership through active participation in and direction of games, discussions, and dormitory life; to develop their power of observing through increased knowledge of agricultural situations; to enable the boys to recognise problems and to know what they can do to resolve them.

Talks and practical demonstrations cover a wider field while specially selected and arranged films greatly extend the range of the boys' educational experiences. Day trips to the laboratories of the Department of Agriculture and Stock and of the Animal Health Station, to Dairy and Bacon Factories and to a stud farm also help to give knowledge of the complexity of agriculture beyond the home farm.

Membership of the school is restricted to boys from primary schools; and preference is given, though not restricted, to boys who live in farming and pastoral areas and who are members of Agricultural Project Clubs.

Nominations are to be made only through the Head Teacher of the local school and parents are advised to take early action through this channel.

The closing date for lodgment of nominations is 1st October. Boys will be notified of selection through their respective Head Teachers not later than 12th November.

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MARKETING

Production Trends—July.

Generally mild and favourable weather prevailed in the dairying districts in July. Dairy stock have wintered well, water supplies are plentiful and there is a keen demand for springers due to farmers returning to the industry. Total butter and cheese production figures for the year 1947-48 in comparison with 1946-47 figures are set out in the following table:—

Year.	Butter.	Cheese.
	tons.	tons.
1946-47	33,079	7,719
1947-48	46,454	9,641

Good conditions were being experienced in all wheat-growing districts at the end of July and sowing had virtually been completed. The area sown for the 1948-49 wheat crop is estimated at 550,000 acres, which represents an increase of 10 per cent. on the 1947-48 acreage of slightly less than 500,000 acres.

On the Atherton Tableland harvesting of the maize crop was somewhat delayed by showery conditions. The crop in this area is expected to produce 17,000 tons.

In the northern tobacco areas seedbeds are making good progress, and fields are receiving final preparation in readiness for planting. Grading is still in progress in the Inglewood-Texas area, where the leaf harvested totals approximately 369,550 lb.

The outlook continues to be favourable in all cattle areas with the exception of the central-west, and it is expected that movements of reasonable numbers of fat stock will be maintained until the end of the current cattle season.

The outlook for sheep in the southern part of the State for August is good. Sheep in the Barcaldine district should maintain condition, but in the Longreach and Winton areas losses may be anticipated in station as well as travelling sheep.

Conditions throughout the pig producing areas of the State remain good and the demand for good quality breeding stock and stores is brisk.

World Meat Production.

The Food and Agriculture Organisation of the United Nations, in a recent publication entitled "Livestock and Meat," points out that meat production in Europe (excluding the U.S.S.R.) during 1947 was at about 60-65 per cent. of the pre-war level and only slightly higher than in 1946. Slaughterings in the United Kingdom, Denmark, Ireland, Sweden and Belgium were lower than 1946 figures.

In the leading exporting countries outside of Europe, aggregate production of meat in 1947 reached approximately the 1946 level, and was about 30 per cent. above the pre-war level, but some decrease was expected in 1948. In the United States, slaughter of cattle and calves reached an all-time record in 1947. In Argentine increased prices had led to relatively high slaughter, and Government action was taken in June, 1947, to restrict the slaughter of the better grades of cows and heifers.

In Australia, the extended drought in 1946 reduced numbers of every species and meat production in 1947 was below that of the previous year. Some improvement was expected for 1948. Canada's production was also down slightly on the previous year, and was only 75 per cent. of 1944's record production. In New

Zealand, cattle numbers have been increasing, and larger feed supplies available during 1947 are believed to have brought an expansion in pig breeding. Lamb and sheep numbers are also expected to increase during 1948 because of more favourable grazing conditions.

Brisbane Wholesale Markets.

Practically all varieties of vegetables were in particularly short supply throughout July, and prices reached what was probably an all-time "all-over" high for the Brisbane wholesale market.

Citrus fruits were in very heavy supply. Clearances of very small or medium to poor quality oranges were difficult to effect at payable prices. Strawberries were plentiful and sold readily at prices satisfactory to growers.

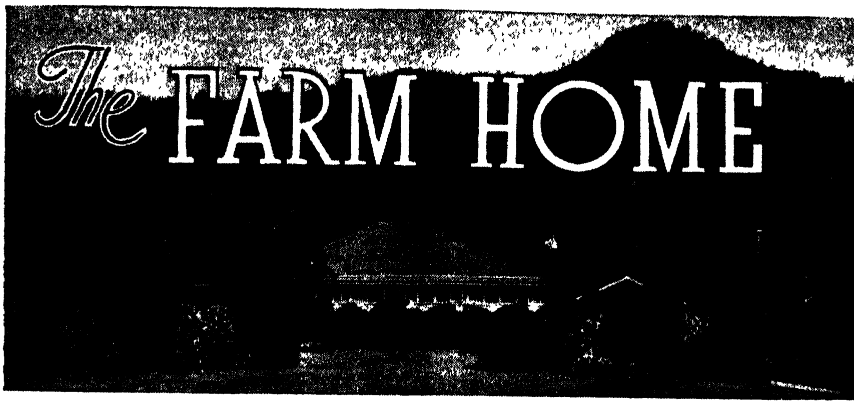
CURRENT FEEDING VALUES FOR MONTH OF JULY, 1948.

(Division of Animal Industry and Division of Marketing).

Feed.	Starch Equivalent Value per 100 lb.	Protein Value per 100 lb.	Average Wholesale Selling Price at Brisbane.	Cost per Starch Equivalent Unit.	Remarks.
			STARCH CONCENTRATES.	d.	
Wheat	72	8	7s. 7d. per bushel	2·11	Supplies of maize and sorghum are very light and only small stacks of meals are available
Wheat meal	72	8	£14 13s. 4d. per ton	2·44	
Maize	78	8	7s. 9½d. per bushel	2·14	
Maize meal	71	8	£16 per ton (short)	2·7	
Sorghum	71	7	£13 10s. per ton	2·03	
Sorghum meal	71	7	£13 10s. per short ton	2·28	
Barley	71	7	Not quoted		
Barley meal	71	7	Not quoted		
Oats	62	8	5s. 9d. per bushel	2·78	
Crushed oats	62	8	5s. 11d. per bushel	2·87	
Pollard	66	10	Not quoted		
Bran	56	10	Not quoted		
Molasses	50	1	47s 6d. per 44 gallons	2·59	
			PROTEIN CONCENTRATES.		
Meat meal	80	55	Not quoted		
Linseed meal	72	25	Not available		
Peanut meal	78	43	Not available		
Blood meal	63	68	Not quoted		
Cottonseed meal	67	33	Not available		
			ROUGHAGES.		
Lucerne hay and chaff	40	10	Hay £6 10s. per ton Chaff £10 10s. ton	1·74 2·81	Wheaten : Very scarce and lacking quality. Lucerne : Mostly poor to inferior hay was offered while the quality of the chaff was fair to medium. Oaten : Supplies arriving from Wagga were very light, which accounted for the increased demand for local consignments.
Oaten hay	33	3	£8 5s. per ton	2·67	
Wheaten hay	33	3	Not available		
Oaten chaff	40	3	Local £12 per ton	3·21	
Wheaten chaff	40	3	Local £10 per ton	2·67	

MINERAL SUPPLEMENTS.

Ground calcium carbonate (limestone), not quoted.
Bone meal, £11 per ton.
Bone flour, not quoted.
Shell grit (dicalcic phosphate), 4s. per bag (40 lb. approx.).



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

PARENTS AND A CHILD'S OBEDIENCE.

THE question of children's obedience is often a vexed one as far as families are concerned and there is no doubt that many mothers and fathers have never given any real thought to the importance of it. Actually parents should before, or at least as soon as their first baby is born, talk the whole question over and settle between themselves what their attitude is to be. *Obedience should apply to important things only*—on unimportant matters children should be given a reasonable amount of freedom. Obedience depends so much on mother and father making *worth-while* demands —not petty ones—and it also depends on their love for the children and their own sense of justice and calmness and firmness.

It is also worth while to explain to children whenever possible why mother or father insists on certain things being done. Children are quite reasonable beings and many a child fails to obey because he cannot understand "why." Commands should only be given when necessary and not just to show authority or to "work off" feelings of anger.

Try to make your commands positive instead of filling them with "don'ts." A sign in the park reading "Please walk on the path" is much more effective than "Keep off the grass." A kindly request is much more likely to be successful with children as with grown-ups. The parent must first be sure he or she is right and then be firm. It is most disturbing to a child to be allowed to do a thing one day and be forbidden to do it the next.

Another important point is that in teaching a child obedience mother and father should present a united front to the child. If they do not agree they must settle their differences away from the child, not in front of him. Otherwise he will quickly learn that one parent can be coaxed to allow what the other refuses. "Mother is right, Sonny," or "You must do what Daddy says" is the right attitude to take.

Do not expect a healthy child to obey commands like "Sit still," "Be quiet," or "Stop fidgeting." These are impossible and unreasonable. Children cannot be quiet and one should not expect them to be.

Another wrong way is to shame, tease, or frighten a child into obeying. This may do more harm than a smacking, which is not usually a good way either. Children should be taught to obey because it is right, not just because they are afraid of being punished.

Always try to find out what is in the child's mind and what he thinks he is doing before correcting him. Many a time a child has the right idea but his method of carrying it out is wrong. Disobedience in children is often the parents' fault and

if a child is constantly disobedient advice should be sought from a children's doctor or the Sister at your Welfare Centre, who will help mother and father to sort out where they have gone wrong in the child's management.

Any further advice on this and other matters connected with children may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

Stuffed Pumpkin.

Requirements.—A small pumpkin, well-shaped; ¾ to 1 lb. cold meat; 1 teacup fine soft breadcrumbs; 1 oz. dripping; 1 oz. flour; ½ pint water; few drops Parisian essence; ½ teaspoonful meat extract; ½ teaspoon onion salt; 1 teaspoon tomato sauce; ¼ teaspoon Worcester sauce; salt, pepper; 1 teaspoon chopped mixed herbs (if liked); about 2 cups cold mashed potato; milk; bacon to garnish.

Method.—

If you have half a pint of left-over gravy, use that instead of making more. Season it with a little tomato and Worcester sauce.

1. With a sharp knife cut rind off pumpkin. Place it to stand in the firmest way and then cut centre piece out of the top. If hole is too small you will have difficulty in removing the soft centre and seeds. Use metal spoon to scrape all that part away and feel with your fingers to make sure you have removed it all.

2. Make gravy as follows:—Melt the fat in a saucepan. Add flour and blend smoothly with wooden spoon. Stir in water by degrees at first. Add sauces and meat extract, colouring, onion salt, and salt and pepper. Stir and boil for three minutes.

3. Put meat through a mincer and turn it into a bowl. Make breadcrumbs and press them through a wire strainer. Mix with meat and add gravy and herbs and mix thoroughly.

4. Fill the pumpkin with mixture almost to top. Mash a little milk into the cold potato and pile it over the hole. Mark with a fork.

5. Have ready a moderate oven and a baking dish with a little boiling fat in it. Put the pumpkin into this and baste sides with the boiling fat.

Bake for about an hour and a-half till cooked through when tested with a skewer. Baste frequently during cooking, reducing the temperature after about an hour to prevent the pumpkin from being over browned.

Cold Fish Mould.

Half pound of any cooked fish, ½ lb. mashed potato, 1 tablespoon raw grated beetroot, 1 dessertspoon chopped parsley, 2 tablespoons thick salad dressing, salt and pepper. Mix all the ingredients well together, and pack into a damp pudding basin or mould, pressing the mixture well down and filling it right to the top. Place a plate or saucer on the top, with a weight to keep it firmly in position, and leave in a cool place for at least two hours, or overnight. Turn out carefully, and serve with salad.

Cold Meat Pie.

Any kind of canned meat or stewing meat, well seasoned. Cook stewing meat or steak, if this is used, seasoning it with herbs and chopped onion, ½ lb. self-raising flour, a good pinch of salt, 3 oz. lard or bacon fat, 5 tablespoons water, pastry. Line a round cake tin with the pastry. Put in the filling, add a little vegetable stock or, if using stewing steak, some of the gravy. Brush edge of pastry with cold water and place a round of pastry on the top, pressing it gently and arranging the pastry so that about half an inch stands up all round. Flute the edges, make a slit in the centre of the pie and bake for half an hour in a moderate oven.

Spicy Fruit and Meat Pie.

Mince lean cold mutton finely and mix in an equal quantity of fat meat and add 4 oz. raisins, ½ lb peeled chopped apples, 4 oz. sultanas, 2 oz. moist sugar, salt and nutmeg. Put the mixture into a well greased piedish, make a pastry cover and bake in a hot oven.

QUEENSLAND WEATHER IN JULY.

Rainfall distribution during July favoured those divisions which hitherto have been experiencing a dry spell, viz., the Carpentaria, Central and Upper Western divisions, where above-average totals were received, thus providing temporary relief. However, in these latter areas, further rains in the near future will be required to promote the spring growth of herbage and thus ensure summer feed. Above-average totals were also recorded in the Peninsula, North Coast and Central Coast East divisions In divisions not mentioned above, rainfall was below average with the exception of the Darling Downs West, but the ample early winter rains received have maintained good winter fodder and the country generally in these areas is in good condition On the Darling Downs area, the fine weather spell has allowed wheat crops to germinate and become established, and prospects for a good crop are bright. The over-average rains registered in inland areas were associated with rainfall activity from the 5th to 6th, 11th to 13th and on the 17th. From the 5th to 6th, all districts with the exception of parts of the Carpentaria, Western and South-Western districts received falls ranging from approximately 50 points to 2 inches. Falls during the period 11th to 13th occurred in the same areas but were more variable and scattered in distribution, varying from very light amounts to 1½ inches. Rainfalls reported inland on the 17th were confined to the western portions of the Carpentaria and Western Divisions, where fairly general falls from ½ inch to 1½ inch occurred. On the coastal areas, falls were spread fairly evenly over the month and were associated with scattered light to moderate shower activity, especially along the North Coast.

Pressure.—The first half of the month was characterized by further pronounced tropical dip and trough features which reached their maximum activity from the 5th to 6th, 11th to the 13th and on the 17th when the good inland rainfall distributions, referred to above, all occurred. This unseasonal tropical activity has been very persistent during the whole of the winter, and can be held responsibe for the best winter rainfall aggregates received in the South-West and South Border divisions since the winters of 1920 and 1921. The situations from the 4th to 6th and 11th to 13th were somewhat similar in that typical tropical dips developed from the Gulf of Carpentaria to the Southern border giving a deep flow of moist tropical air over inland Queensland. Condensation from this tropical air occurred when vigorous southern depressions and their associated cold fronts extended their influence into the Queensland region. The rainfall registered on the 17th was associated with an upper level rather than a surface situation, which moved into Western Queensland from Central Australia. In the latter case, however, the moist tropical air was still present at lower levels. During the second half of the month both the tropical influences and southern depressions decreased in activity and the typical winter type of pressure control asserted itself.

Temperatures.—Maximum temperatures were slightly above normal in the Peninsula and inland divisions with the exception of the Western, South Western and Maranoa divisions. All coastal areas again recorded below-average readings. Minimum temperatures were above normal in all divisions except the Upper Western, parts South Western, Maranoa and parts of the South Coast Port Curtis division. Many frosts were reported in the south-eastern quarter of the State, especially on the Darling Downs and adjacent areas, where they were practically continuous during the second half of the month with some very sharp temperatures. The Central and South Western districts also experienced increased frost activity as compared with the previous month. The centre in which most frosts occurred was Stanthorpe, 28 days (lowest temperature on 8th 18 degrees in screen, 7 degrees on grass this being lowest terrestrial since 7 degrees on 6/7/46, lowest on record being 5.7 on 19/7/33).

The rain position is summarised below:—

Divisions.	Normal Mean.	Mean July. 1948.	Departure from Normal.
	Points.	Points.	Per. Cent.
Peninsula North	42	42	..
Peninsula South	24	47	96 above
Lower Carpentaria	20	57	185 ,,
Upper Carpentaria	42	80	90 ,,
North Coast, Barron	114	158	39 ,,
North Coast, Herbert	179	250	40 ,,
Central Coast, East	111	126	14 ,,
Central Coast, West	65	63	3 below
Central Highlands..	116	198	71 above
Central Lowlands	82	120	46 ,,
Upper Western	41	64	56 ,,
Lower Western	51	28	45 below
South Coast, Port Curtis	178	170	5 ,,
South Coast, Moreton	227	89	61 ,,
Darling Downs, East	181	153	16 ,,
Darling Downs, West	141	151	7 above
Maranoa	147	134	9 below
Warrego	107	103	4 ,,
Far South-West	69	47	32 ,,

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

OCTOBER, 1948.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.29	5.47	Cairns	36	22	Longreach	38	31
6	5.23	5.49	Charleville ..	28	26	Quilpie	34	36
11	5.18	5.52	Cloncurry ..	55	45	Rockhampton ..	13	7
16	5.13	5.55	Cunnamulla ..	29	30	Roma	18	16
21	5.7	5.58	Dirranbandi ..	18	20	Townsville ..	30	19
26	5.3	6.1	Emerald	22	16	Winton	44	36
31	5.0	6.4	Hughenden ..	40	30	Warwick	3	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Day.	Rise.	Set.
	a.m.	p.m.
1	4.25	4.02
2	5.02	5.10
3	5.38	6.17
4	6.13	7.24
5	6.51	8.30
6	7.31	9.36
7	8.16	10.40
8	9.04	11.40
9	9.57	..
		a.m.
10	10.52	12.35
11	11.49	1.23
12	12.46	2.05
	p.m.	
13	1.41	2.42
14	2.34	3.14
15	3.27	3.44
16	4.19	4.12
17	5.12	4.39
18	6.06	5.08
19	7.02	5.37
20	8.01	6.10
21	9.02	6.48
22	10.04	7.31
23	11.05	8.22
24	..	9.20
	a.m.	
25	12.02	10.23
26	12.54	11.29
		p.m.
27	1.39	12.37
28	2.20	1.44
29	2.57	2.51
30	3.32	3.56
31	4.07	5.01

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS)

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	14	23	30	39	5	14	34	44
6	27	12	43	26	18	1	51	29
11	29	10	45	24	20	0	52	27
16	19	17	36	33	10	8	41	37
21	11	28	26	43	0	19	28	51
26	11	28	26	43	0	19	28	52
31	21	15	37	31	12	7	43	35

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	19	37	42	56	27	41	17	32
3	31	24	51	46	35	32	25	21
5	43	12	59	38	44	24	36	12
7	52	4	66	33	50	19	43	5
9	56	2	68	32	52	17	46	3
11	53	4	67	33	50	19	44	5
13	45	10	61	37	46	23	37	10
15	35	20	54	44	39	29	29	18
17	26	30	47	50	32	35	22	25
19	16	39	41	57	26	42	14	34
21	7	49	36	63	20	49	7	41
23	2	55	33	67	17	52	3	45
25	3	53	34	66	18	51	4	44
27	11	45	38	60	23	46	10	37
29	21	33	44	54	29	38	18	29
31	34	21	53	44	38	29	28	18

Phases of the Moon.—New Moon, 3rd October, 5.42 a.m.; First Quarter, 10th October, 8.10 a.m.; Full Moon, 18th October, 12.33 p.m.; Last Quarter, 25th October, 11.41 p.m.

On 15th October the Sun will rise and set approximately 10 degrees south of true east and true west respectively; and on 2nd and 17th October the Moon will rise and set approximately at true east and true west respectively.

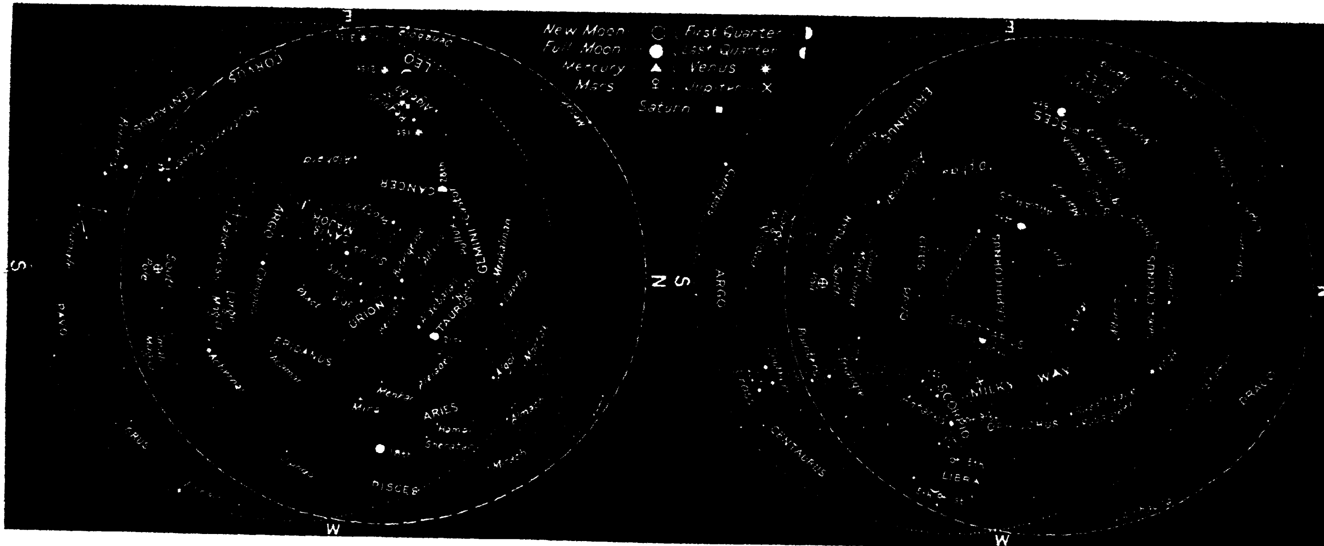
Mercury.—In the constellation of Virgo at the beginning of the month, when it will set about 2 hours after the Sun. By the 20th it will be in line with the Sun, after which it will become a mornng object and by the 31st wil rise atout ¾ hour before sunrise.

Venus.—A morning object in the constellation of Leo at the beginning of October, when it will rise between 3.20 a.m. and 4.30 a.m. On the 5th it will pass less than 1 degree south of Regulus and on the 8th about 1 degree south of Saturn. By the end of the month, in the constellation of Virgo, it will rise between 3 a.m. and 4.15 a.m.

Mars.—At the beginning of the month, in the constellation of Libra, will set about 3 hours atfer the Sun, and at the end of the month, in the constellation of Scorpio, will set about 2½ hours after sunset.

Jupiter.—Still an evening object, and on the 1st will set a little before midnight, while on the 31st, in the constellation of Sagittarius, it will set between 9.45 p.m. and 11 p.m.

Saturn.—Now a morning object in the constellation of Leo. On the 1st it will rise between 3.45 a.m. and 5 a.m. and on the 31st between 2 a.m. and 3.15 a.m.



Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th October. (For every degree of longitude we go west the time increases by 4 minutes.) The chart on the left is for 9 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JULY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall. July	Average Rainfall. No. of years' records.	Total Rainfall. July 1947.	Total Rainfall. July 1948.
North Coast.	In.		In.	In.
Atherton	1·12	42	0·79	1·61
Cairns	1·53	61	1·40	2·59
Cardwell	1·38	71	1·00	1·58
Cooktown	0·98	67	1·74	1·01
Herberton	0·89	57	0·40	1·14
Ingham	1·69	51	0·79	1·91
Innisfail	4·75	62	2·84	7·66
Mossman	1·19	19	1·73	3·05
Townsville	0·67	72	Nil	1·07
Central Coast.				
Ayr	0·73	56	Nil	0·78
Bowen	0·93	72	0·08	0·35
Charters Towers	0·67	61	Nil	0·48
Mackay	1·64	72	0·18	2·85
Proserpine	1·58	40	0·63	1·41
St. Lawrence	1·36	72	Nil	1·74
South Coast.				
Biggenden	1·41	44	0·37	1·30
Bundaberg	1·83	60	0·22	2·11
Brisbane Bureau	2·16	95	0·34	0·53
Caboolture	2·37	67	1·22	0·58
Childers	1·70	48	0·22	1·31
Crohamhurst	2·90	50	0·17	0·89
Esk	1·90	56	0·08	0·64

Divisions and Stations.	Average Rainfall. July	Average Rainfall. No. of years' records.	Total Rainfall. July 1947.	Total Rainfall. July 1948.
South Coast—cont.	In.		In.	In.
Gatton College	1·37	44	0·06	..
Gayndah	1·47	72	0·09	1·83
Gympie	2·07	78	Nil	0·86
Kilkivan	1·50	62	0·15	0·77
Maryborough	1·93	72	0·02	1·37
Nambour	2·67	47	0·87	1·01
Nanango	1·65	61	0·15	0·99
Rockhampton	1·73	72	0·20	1·51
Woodford	2·28	55	0·11	0·41
Central Highlands.				
Clermont	1·06	47	Nil	2·20
Springsure	1·18	74	Nil	2·09
Darling Downs.				
Dalby	1·71	73	0·08	1·27
Emu Vale	1·57	47	0·42	1·13
Jimbour	1·48	64	0·18	1·34
Miles	1·62	58	0·05	1·58
Stanthorpe	2·00	70	1·16	1·33
Toowoomba	2·06	71	0·16	1·58
Warwick	1·80	78	0·55	1·35
Maranoa.				
Roma	1·43	69	Nil	1·09
St. George	1·21	62	0·41	1·26

CLIMATOLOGICAL DATA FOR JULY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature. Mean Max.	Shade Temperature. Mean Min.	Extremes of Shade Temperature. Max.	Date.	Min.	Date.	Rainfall. Total.	Rainfall. Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	78	64	82	27	57	19	259	11
Herberton	..	71	52	77	23	39	19	114	9
Townsville	..	76	60	82	13, 23	48	20	107	6
Rockhampton	30·15	73	49	81	28	41	19, 20 21, 24	151	4
Brisbane	30·17	69	48	74·2	22	36·8	8	53	7
Darling Downs.									
Dalby	..	65	36	74	27	25	7	127	6
Stanthorpe	..	59	30	67	1, 27	18	8	133	8
Toowoomba	..	61	36	68	1	24	8	158	7
Mid-Interior.									
Georgetown	..	85	58	91	28	45	25	100	4
Longreach	30·17	74	47	84	26, 28	38	30	65	1
Mitchell	30·22	65	35	76	26	28	4	101	3
Western.									
Burketown	..	84	57	89	28	48	24, 25	29	2
Boulia	30·08	72	46	81	26, 31	34	7	59	2
Thargomindah	30·18	65	39	79	31	32	8	49	1

A. S. RICHARDS,
Deputy Director, Meteorological Services

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

Volume 67 Part 3

QUEENSLAND AGRICULTURAL JOURNAL

Edited by
C. W. WINDERS, B.Sc.Agr.

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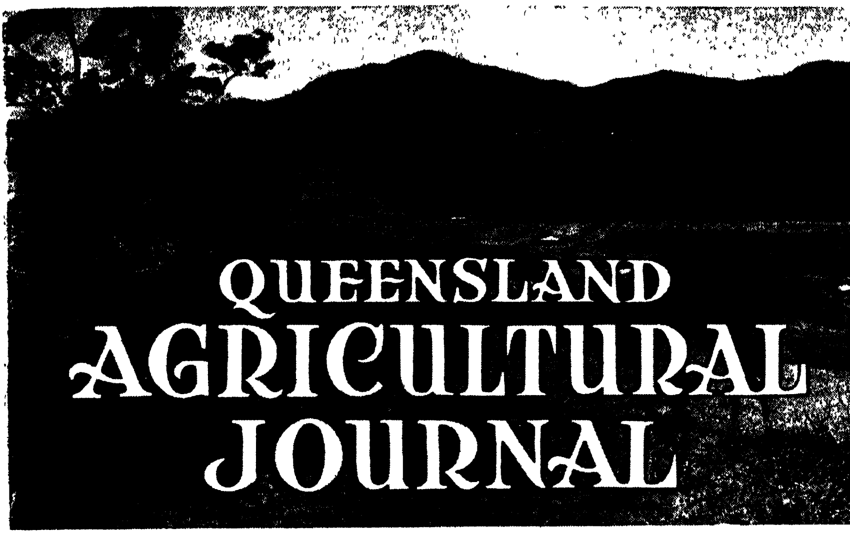
5

Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Art, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**



Volume 67 | 1 SEPTEMBER, 1948 | Part 3

Event and Comment.

Prospects for Linseed.

WITH increasing amounts of the Asiatic production of linseed being utilised locally, and South American supplies largely unavailable to Australia because of the dollar position, a severe shortage of linseed oil for industrial purposes exists in Australia. This shortage is unlikely on present prospects to be relieved to any great extent for some considerable time.

Not only is the scarcity of linseed oil hampering Australian industry, but what oil is imported comes largely in the prepared form, which means that the by-products remain in the processing country. This deprives Australian stockraisers of what was once a substantial supply of a protein-rich concentrate—linseed meal.

A determined effort is being made to establish the linseed-growing industry in Australia on a scale which will enable the nation's demands to be met from local sources within a measurable period. Queensland has appeared to the commercial interests which are endeavouring to promote linseed-growing in Australia to offer excellent prospects as a producing State. As evidence of this, they allocated from the limited seed supplies available to them sufficient to plant nearly 6,000 acres in Queensland in the current season. A large proportion of the seed crop is expected to go back to contracting growers for the planting of a greatly expanded acreage in 1949.

During the past two seasons practically the whole of the plantings have been of the variety Walsh, but it is quite likely that among the commercial varieties of the flax plant which are grown for the production of linseed there are better varieties than Walsh for Queensland conditions. Both the State Department of Agriculture and Stock and the Commonwealth Council for Scientific and Industrial Research are engaged in one or more phases of the various steps of plant introduction from overseas, preliminary sorting out of varieties, larger scale field testing of promising varieties and assessment of the quality of the seed for processing purposes.

If present hopes are realised and the State is supplying substantial quantities of linseed to processors within the next few years, Queensland agriculturists will have gained a twofold benefit. Not only will they have attained a greater diversification of farming, but they may expect to share in the additional supply of protein concentrate made available.

Importation of Stud Stock.

THE Minister for Agriculture and Stock (Hon. H. H. Collins) has reminded Queensland livestock producers that the State Government, in conjunction with operators of certain overseas shipping services, offers assistance in the importation of approved stock from Great Britain and New Zealand.

For the most part, Australian studs are producing excellent animals, which as they are introduced to herds and flocks throughout the country are gradually raising the breeding quality of livestock. But even the best-served breeds would benefit from an infusion of the blood of first-class imported animals, and in addition those breeders who have a very limited number of studs from which to choose their breeding animals would appreciate a wider choice.

It is now becoming more generally recognised that the sire plays an outstanding part in the quality of the offspring, whether beef cattle, dairy cattle, sheep, pigs, poultry or horses. The assistance offered to primary producers in connection with the importation of stud animals is an indication of the Government's desire to increase the facilities for improvement not only of herd and flock sires but of all breeding stock.

Interested stockraisers should address their inquiries to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Rural Training for Ex-Servicemen.

MANY ex-servicemen readers of the *Journal* may not yet be aware that they are offered opportunities in rural training which may be of immeasurable assistance to them if they are engaged in rural pursuits.

In brief, approved ex-servicemen are offered a course in both practical and theoretical farming. The course is provided at the Queensland Agricultural College at Gatton and embraces a wide range of crop and livestock farming. The training is entirely free and in addition the student is paid a generous allowance while attending the course. Further particulars may be obtained on application to the Deputy Director of Rural Training, Department of Post War Reconstruction, National House, Ann Street, Brisbane.

Field Crops

Soil Conservation.

TWENTY-ONE POINTS TO REMEMBER.

1. Don't try to treat the symptoms of erosion before remedying the cause. Measures for the reduction of run-off water from sloping land should receive first consideration.

2. Control of run-off commences at the crest of a watershed and extends to the creek bed.

3. Aim at the absorption of as much water as possible where it falls and provide a safe means of disposal for the surplus.

4. Use of vegetative cover, including crop residues and green cover crops, is an important factor in soil and rainfall conservation.

5. Rainwater allowed to escape from your farm as run-off represents loss of production and farm income. More serious still, it often involves the loss of soil as well.

6. The topsoil, which is the most valuable part of your land, is the first to be removed by erosion. Sheet erosion can proceed to an advanced stage if the land is not kept under close observation.

7. The effects of erosion are cumulative and the process accelerates as the condition of the land deteriorates.

8. Subsoil farming is usually starvation farming.

9. Carefully plan the layout and use of all parts of your farm and develop it in accordance with this plan. This means using each part of your farm for the purpose for which it is best suited.

10. The natural resources of forest, soil and water are intimately related. Proper treatment and use should be made of all three in the land use plan.

11. Don't burn stubble or other crop residues if you can possibly help it.

12. Don't bare fallow your land during the stormy summer months.

13. Be cautious with forest and grass fires, as they destroy close ground cover.

14. Don't attempt to determine levels with your eye or to design drainage systems haphazardly.

15. A well managed farm of moderate size will return more than a badly managed farm of large size.

16. The farmer who can plough a straight furrow is not necessarily a good farmer. Contour farming has many advantages over square or rectangular farming.

17. Learn to recognize the signs of erosion when you see them.

18. Erosion means much more than troublesome gullies, buried fences, or stunted crops. In the end it means the death of the land itself.

19. The health of human beings is largely governed by the health of the soil that grows their food.

20. Prevention of erosion is far easier than cure.

21. Conservation farming is natural commonsense farming. In comparison with many existing methods it ensures a more efficient use of rainfall, improved yields from crops and pastures, protection of the land against erosion, and a better and more stable farm income. It means maintaining our land and water resources in a productive and useful condition for this generation and all generations to follow.

A. F. SKINNER, Soil Conservationist.

THE QUEENSLAND YEAR BOOK, 1947.

The recently-issued official yearbook for Queensland contains a mass of information ranging from geography and climate of the State to public finance and provides a ready reference book to the resources and development of Queensland.

Maps showing rainfall incidence and variability are an interesting feature for the man on the land, as are also the informed comments on rural production and marketing of farm products and the statistical information.

This 400 page publication is available from booksellers at the low price of two shillings per copy.

EXHAUST GAS FOR MICE.

A Clifton reader of the *Journal* sends in a suggestion for dealing with infestations of mice and rats in grain stacks. He has had good results by connecting a $\frac{3}{4}$ or 1-inch garden hose to the exhaust pipe of a motor car or truck by means of a short length of bicycle tube, and running the engine to discharge carbon monoxide gas. If the grain stack is small enough to be covered by means of a tarpaulin, a complete kill can be effected. If the pile is not covered, by inserting the hose into the stack at various points the mice and rats are driven out in a dazed condition and can be easily killed.

VEGETABLE PRODUCTION

Tomato Variety Investigations in the Stanthorpe District.

A. A. ROSS, Horticulturist, Horticulture Branch.

THE area planted annually to tomatoes in the Stanthorpe district is approximately 1,500 acres and returns in the vicinity of 250,000 half-bushel cases. The industry is important to Queensland largely because the whole of this production becomes available during the summer months, when tomatoes can be grown only with difficulty in other parts of the State. However, it will be observed that the per acre yield of marketable fruit is alarmingly low. There are numerous factors which can contribute towards this poor yield. Some of these are climatic and, therefore, beyond control, but others can be successfully overcome if given reasonable attention. A survey indicated that while inefficient systems of culture and improper attention to pest and disease control were helping to keep yields at a low level, the use of unsuitable varieties was largely responsible for this relatively poor return. This conclusion prompted the commencement of an investigation into the whole question of tomato varieties for the district.

The tomato is a plant which shows a marked varietal adaptation to local conditions, and varieties which thrive in coastal districts of Queensland may fail to do well inland. In addition, the crop in the Stanthorpe district is grown during the summer months and, therefore, it is reasonable to expect that varieties different from those which are found suitable for the autumn, winter, or spring crops on the coast will be required there. For example, Break o' Day, which is a very popular variety in coastal districts, usually fails to produce satisfactory yields in the Stanthorpe district.

LOCAL REQUIREMENTS.

In the majority of cases, tomatoes are produced in the Stanthorpe district without the aid of irrigation, and since they are grown during the summer transpiration of water from plants is relatively rapid. This demands that the plants should be grown on the ground in the bush form, as staking and pruning have the effect of increasing the rate of transpiration and inducing the onset of blossom-end rot.

Sunburning of fruit is an ever present danger during the growing period of the crop; therefore, types which show some resistance in this respect should be chosen.

The late summer months are usually wet and conditions are favourable for the spread of leaf diseases such as target spot and Septoria leaf spot; thus, varieties which either show some tolerance to these diseases or have such a habit of growth as to permit the effective application of fungicides are to be favoured. Fusarium wilt, which is a devastating disease in many tomato-growing areas, seldom causes serious losses in crops in the Stanthorpe district even when susceptible varieties are grown. Therefore, resistance to this disease becomes a factor of minor importance in assessing the suitability of a variety, at the present time, for these conditions.

The market at the time when Stanthorpe tomatoes arrive demands a smooth, round fruit of 2¾ in. to 3 in. diameter; and, since it usually has to travel considerable distances before being consumed, it must be firm and have a tough skin and solid walls. Absence of ribbing, roundness of shape, and uniformity of size of fruit speed up the operation of packing and give the finished case a much more attractive appearance. For this reason, corrugated Chinese types and small cluster varieties are not desirable. Fruit less than 2 in. in diameter usually does not find a ready market and varieties which normally produce a large proportion of these fruits are, therefore, unprofitable to grow. The production of many small fruits and lack of uniformity in fruit size were perhaps the most serious defects of the varieties grown prior to 1944.

CLASSIFICATION OF TOMATO VARIETIES.

There are certain classes of tomato varieties which cannot be expected to meet commercial requirements in the Stanthorpe district. Cluster varieties, while producing a very large number and weight of fruit, usually form fruit of a size too small for market requirements. Corrugated Chinese varieties do not find ready sale on the markets available to Stanthorpe growers; in addition, they require hand grading

Large, Smooth, Round Types.	Small, Cluster Types.	Corrugated, Flat, Chinese Types.	Ornamental Types
Bonny Best	**Ailsa Craig**	**Adelaide Dwarf Red**	**Cherry**
Break o' Day	**Best of All**	**Burwood Wonder**	**Currant**
Burwood Prize	**Britain's Best**	**Burwood 44**	**Farthest North**
Chalk's Early Jewel	**Essex Wonder**	**Mortgage Lifter**	**King Humbert**
Denisonia (Bowen Buckeye Globe)	**Kondine Red**	**Orange Prolific**	**Red Pear**
Earliana	**Heterosis**	**Rouge de Marmande**	**Red Plum**
Grosse Lisse	**Market King**	**South Australian Dwarf**	**San Marzano**
Marglobe	**Potentate**	..	..
Marhio	**Prosperity**	..	..
Marvana	**Radio**	..	..
Matchless	**Recruit**	..	..
Norton	**Salads Special**	..	..
Nystate	**Sensation**	..	..
Pearson	**Sterling Castle**	..	..
Penn State	**Vetomold**	..	..
Penn Heart	..	..	..
Pritchard	..	..	..
Rutgers	..	..	..
Sioux	..	..	..
Stone	..	..	..
Valiant	..	..	..

and are difficult to pack. Small ornamental types are not intended for commercial production on the fresh fruit market and their uses are generally confined to home garden purposes or canning.

In the accompanying table the varieties are classified on the basis of shape and size of fruit. The class of large, smooth, round types can be further divided according to shape, breeding, and habit of growth, but such classification is difficult and serves little useful purpose. This table enables the potential value of many varieties to be determined at a glance.

EXPERIMENTAL DETAILS.

The investigations were conducted over four years on individual farms and followed trials which had been commenced in the Brisbane area two seasons previously. Seed of all available varieties was collected from many sources, including the United States Department of Agriculture, the Division of Plant Industry of the Council for Scientific and Industrial Research, and many seedsmen throughout Australia. In the first year all varieties on hand were grown and outstanding plants of the most successful varieties were selected as parents of the material used in trials of the following year. Single plant selection, on the basis of yielding capacity, size and shape of fruit and freedom from disease, was continued for several generations until a desirable type of plant was established which would reproduce itself with a high degree of uniformity. In addition, as a collateral project, several new varieties were introduced each season from various sources and compared with the best pedigreed strains. Selections were also made on any variety which showed promise, and these were included in the subsequent strain trials.

Cultural operations and pest and disease control methods followed Departmental recommendations throughout and were performed by the growers on whose properties the various plots were laid down.

In the collection of data, only fruits of 2-in. diameter and larger were harvested. This had the effect of debarring varieties which normally produce a large number of small fruit from being credited as heavy yielders. In other words, yield of marketable fruit was recorded rather than total yield. Observations on fruit quality, which includes uniformity of size and shape, desirability of size and shape, freedom from blemishes, flesh texture, absence of puffiness, flesh colour, carrying capacity, and resistance to fruit and leaf diseases were taken into account with yielding capacity in evaluating each variety.

DISCUSSION OF VARIETIES TESTED.

The varieties tested have been divided into four groups according to their suitability for the Stanthorpe district. These are:—

(1) High yielders of first quality fruit which may be relied upon to crop well consistently;

(2) High yielders of good quality fruits in certain seasons but which are somewhat exacting in their environmental requirements;

(3) Moderate yielders of fair quality fruit which require ideal growing conditions to produce payable yields;

(4) Varieties which possess some serious defect and cannot be recommended for growing in the Stanthorpe district.

Group 1.

In all Stanthorpe trials, varieties included in this group have yielded consistently well and have produced fruit of excellent quality under a wide range of climatic conditions. As described earlier, a rigid system of plant selection has been conducted on these four varieties and uniform strains of them have been developed. A scheme has been inaugurated whereby certified seed of these varieties will be available to growers in 1949. In trials which were conducted under conditions normal to the district in all respects, yields of these four varieties have been consistently in the vicinity of 800 half-bushel cases per acre, and specially selected plants have yielded up to 30 lb. of marketable fruit, which is equivalent to 1,500 cases per acre. It can be reasonably anticipated, therefore, that given proper attention these varieties will produce yields far in excess of those commonly grown in the past.

Grosse Lisse.

Introduced from Northern Africa into Australia in 1939 by the New South Wales Department of Agriculture, this variety has proved very suitable for local conditions. It is a mid-season variety, which commences to harvest in approximately eleven weeks after transplanting and will continue for about seven weeks. The bush is of medium size, semi-erect, non-determinate, and with foliage of medium density (Plate 40). Leaves are long and broad and of the normal tomato type. The main stem is fairly heavy, branches freely, and is capable of carrying a heavy crop. The fruit is large, circular in transverse section, and slightly pointed in longitudinal section. The stem-end cavity is shallow with a relatively large corky ring. Mature green fruit is pale green in colour with darker shoulders, free from ribbing. There is an absence of streaks at the stylar end and the scar is very small and slightly depressed. The fruit ripens to a bright red colour and has a smooth, slightly tender skin. The internal flesh is red, of fine, soft texture with a large, fleshy central mass free from fibrous core. Cells are well supplied with juice and have no air-space. The inner walls are thick and the outer of medium thickness, which ensures good carrying. The placentae are large and carry a considerable number of comparatively large seeds. There are approximately 7,000 seeds (dry) per oz. and about 12 lb. of ripe fruit yield an ounce of seed. The flavour is somewhat sweet and mildly acid.

Grosse Lisse is a large tomato of which practically the whole crop will reach marketable size when given reasonable attention. It is of excellent quality, yields heavily even under relatively hard conditions, and the fruit very seldom cracks. The recommended planting distance in Stanthorpe soils is 6 ft. by 6 ft.

Rutgers.

Introduced into Australia in 1934 from the New Jersey Agricultural Experiment Station, where it was selected from the progeny of a cross between Marglobe and J.T.D.

It is a late variety with a large, dense, erect, non-determinate vine and is a consistent cropper. Leaves are long and broad and rather dark in colour. The main stem is thick and branches freely. The fruit is large, circular in both transverse and longitudinal sections, and can

Plate 40.

A FIELD OF TOMATOES, VARIETY GROSSE LISSE, SHOWING SEMI-ERECT PLANTS OF MEDIUM SIZE.

best be described as deep globe-shaped. Shoulders are smooth and the stem-end cavity shallow with a medium-sized corky ring. The stylar scar is very small and smooth. Cracking is rare, the radial type being the more common. The mature green fruit is bright green in colour with darker shoulders and ripens to a bright red. The skin is smooth, tough, and yellow. The internal flesh is red, firm, and of fine texture. The cells are juicy and free from air-space, with outer and inner walls of medium thickness. Placentae are of medium size and carry small seeds, approximately 10,000 weighing 1 oz. (dry). About 23 lb. of fruit are required to yield an ounce of seed. The flavour is somewhat acid.

Rutgers is a tomato of reasonably good carrying capacity and will produce a reasonable crop even under unfavourable conditions. Size is good, and this, combined with its deep globe shape, facilitates grading and packing. It is, therefore, popular with growers and will be an important variety in this district for a long time. Recommended planting distance is 6 ft. by 6 ft.

Sioux.

An introduction from Nebraska, U.S.A., which has proved very satisfactory under Stanthorpe conditions. It is of recent origin and resulted from a cross between All Red and Stokesdale.

It is a first-early variety which yields heavily up till the final packing. It has a medium-sized, very open, sprawling type of non-determinate bush with long, narrow, normal tomato type leaves (Plate 41). The main stem is of medium thickness and branches fairly

Plate 41.

A SINGLE PLANT OF THE VARIETY SIOUX, AT THE TIME OF SETTING OF THE FIRST FRUIT, SHOWING ITS SPREADING HABIT OF GROWTH.

Plate 42.

A SINGLE PLANT OF THE VARIETY VALIANT, AT THE TIME OF SETTING OF THE FIRST FRUIT, SHOWING ITS COMPACT HABIT OF GROWTH.

freely. The fruit is of large size, circular in transverse section, and slightly flattened in longitudinal section. The stem-end cavity is shallow with a comparatively large corky ring and smooth shoulders. The stylar scar is small and smooth. Cracking is very rare. The mature green fruit is pale green in colour with no darkening of the shoulders, and it ripens to a bright red. The skin is smooth and tough. The internal flesh is pinkish red, of fine texture, and free from core. The central mass is of medium size, fleshy, and firm. The cells have no air-space, are juicy, and have thick inner and outer walls. Placentae are of medium size and carry seeds of medium size—approximately 8,000 per oz. (dry). Approximately 22 lb. of ripe fruit yield an ounce of seed. It has a sweet acid flavour.

Sioux is a heavy yielder of excellent quality fruit and is the best early variety encountered for Stanthorpe conditions. Recommended planting distance is 6 ft. by 6 ft.

Valiant.

Introduced from U.S.A. in 1936, but otherwise its origin is somewhat obscure. It has proved very successful in all trials in the Stanthorpe district.

The vine is vigorous, erect, compact, determinate, and densely covered with long, broad leaves of the normal tomato type (Plate 42). It has a thick main stem and branches freely. The mature green fruit are deep green in colour with a dark green shoulder. They are deep-globe shaped, very smooth, with a very shallow stem-end cavity. The stylar scar is smooth and very small. No evidence of cracking appeared in any of the trials with this variety. The fruit ripens to a bright red colour and has a smooth, tough skin. The internal flesh is red, of fine texture, and has no fibrous core. The cells are juicy, free from air-space, and both inner and outer walls are thick. The placentae are small and carry

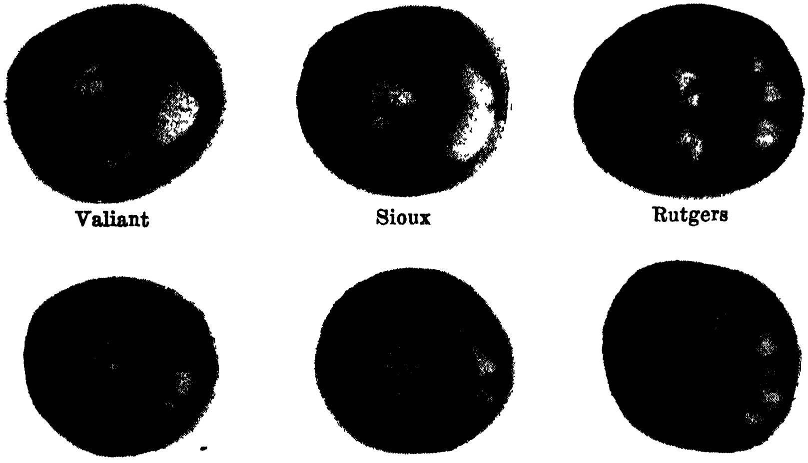


Plate 43.

FRUIT OF SIX TOMATO VARIETIES SHOWING THE DESIRABLE GLOBE SHAPE AND SMOOTH OUTLINE.

medium-sized seeds—approximately 8,000 per oz. (dry). About 17 lb. of fruit yield an ounce of seed. The flavour is slightly acid. This variety appears to possess a high resistance to target spot, as in all trials foliage was remarkably free from this disease and remained green much longer than that of other varieties.

Valiant produces a fruit of exceptionally high quality and yields very well. Its compact bush would permit of its being spaced more closely in the row and it is recommended that it be planted at 4 ft. 6 in. by 6 ft. spacing.

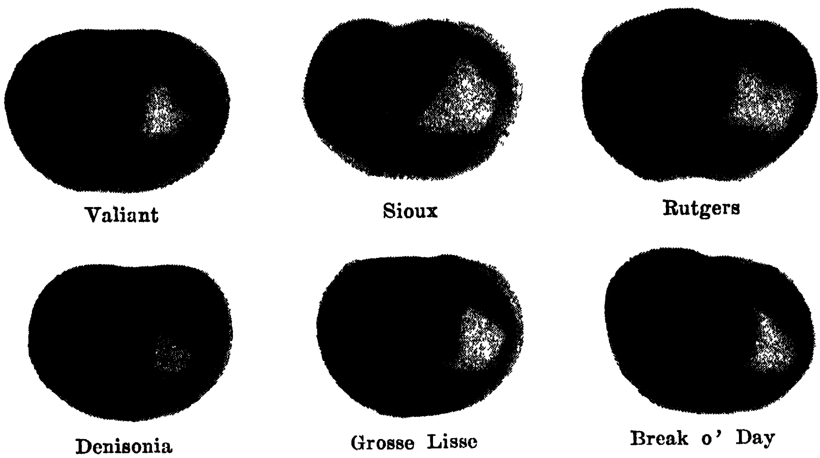


Plate 44.

FRUIT OF SIX TOMATO VARIETIES SHOWING THE DESIRABLE GLOBE SHAPE AND SMOOTH OUTLINE.

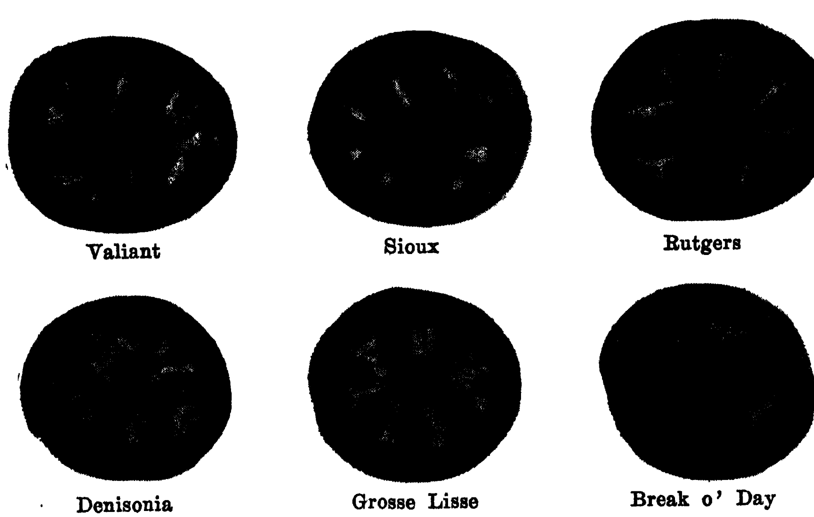


Plate 45.

CROSS SECTIONS OF FRUIT OF SIX TOMATO VARIETIES SHOWING DIFFERENCES IN INTERNAL STRUCTURE.

(To be Continued.)

Codling Moth Control Experiments, 1947-48.

A. W. S. MAY, Entomologist, Science Branch, and K. FISHER-WEBSTER, Experimentalist, Horticulture Branch.

THOUGH the results obtained at Stanthorpe for the season 1946-47 had confirmed the value of a 0.1 per cent. DDT spray for codling moth control, many problems still remained to be solved before orchardists could use this insecticide efficiently. Accordingly, further experiments were carried out in the 1947-48 season to clear up some of the difficulties that face apple growers adopting a DDT cover spray schedule.

EXPERIMENTAL PROCEDURE.

Forty-five trees of the late-maturing Granny Smith variety, showing uniformity of vigour, were chosen for the experiment, chiefly because the fruit would be subject to codling moth attack for the greater part of the season. These were divided into five blocks of nine trees each. Eight different spray schedules were devised, and for the purpose of gauging codling moth activity within the experimental area, unsprayed plots were included in the series. Each of these nine treatments was applied, in turn, to single tree plots within each of the five blocks.

The treatments were designed among other things to shed light on the following points:—

(*a*) The merits of DDT in emulsion and dispersible powder type sprays;

(*b*) The efficiency of semi-dormant oil-lime sulphur sprays and summer sprays containing wettable sulphur or hexaethyl tetraphosphate* in keeping red mite in check; and

(*c*) The necessity or otherwise for a calyx spray in the codling moth control programme when DDT is used in the cover sprays.

The treatment schedule and the amount of codling moth damaged fruit in each are indicated in Table 1.

Codling moth, though not as severe as in the previous season, caused appreciable loss of fruit on unsprayed trees, for only 26 per cent. of the harvested fruit was unblemished. The inclusion of unsprayed trees ensured an active moth population throughout the experimental area for the greater part of the season; thus, despite the use of DDT in most schedules, codling moth damage was more severe than that experienced on the majority of orchards in the Granite Belt where DDT was applied to all trees.

* Marketed in Queensland as "Hexone."

TABLE 1.

CODLING MOTH CONTROL SCHEDULES (1947-48).

Schedule.	Semi-dormant Spray.	Calyx Spray.	*Cover Sprays.	†Injured Fruit.
				Per cent.
1	..	Lead arsenate ..	Lead arsenate	20·1
2 . ..	Oil-sulphur	DDT	DDT	20·2
3 ..	..	DDT	1, 3, 5—DDT + Hexone 2, 4, 6—DDT	18·1
4 ..	..	DDT	1, 3, 5—DDT + Sulphur 2, 4, 6—DDT	17·6
5	..	..	DDT	17·6
6 . ..	..	Lead arsenate ..	DDT	18·6
7	..	Lead arsenate ..	DDT (emulsion)	7·6
8	..	Lead arsenate ..	..	68·5
9	..	..	..	73·3

* Unless otherwise stated, DDT sprays were prepared from a dispersible powder concentrate.

† Based on harvested fruit and including both stung and wormy apples. Many of the stung fruits would be marketable.

Altogether, six cover sprays were applied. The timing of the first and second coincided with definite periods of moth activity as determined from lure trap records. The subsequent cover sprays followed a three-weekly schedule as moth activity on the rest of the orchard was not sufficient to permit the efficient functioning of lures later in the season.

DISCUSSION.

Codling Moth.

The inclusion of a lead arsenate schedule in the trial enabled a comparison to be drawn between this and the various DDT schedules. Following the results of last season's experiments, zinc sulphate and hydrated lime were incorporated with the lead arsenate in treatment 1, the zinc sulphate to increase the insecticidal efficiency of the spray and the hydrated lime to lessen the likelihood of spray injury. On the whole, there was a strong suggestion that the DDT schedules were more efficient than the lead arsenate schedule, but conclusive evidence on this point was not obtained.

The addition of hydrated lime greatly reduced the amount of foliage injury from lead arsenate, but this spray hazard was not entirely eliminated. Varying degrees of foliage injury were noticeable on all trees receiving the lead arsenate-zinc sulphate-hydrated lime schedule, a condition not associated with DDT sprays. Also, the inclusion of zinc sulphate and hydrated lime greatly increased the spray residue problem and this makes the combination spray undesirable late in the season. Because of the excellent results obtained with DDT, it is doubtful whether lead arsenate will retain its place in the general orchard spraying programme, at least for cover spray usage.

All DDT schedules gave efficient codling moth control and evidence was obtained that, at the concentration used (0·1 per cent.), DDT emulsion was more efficient than the dispersible powder. Noticeable spray residues were absent on plots receiving DDT spray schedules, and clean attractive fruit was harvested from all trees sprayed with the insecticide.

Despite the inclusion of spray schedules designed primarily to elucidate the value of a calyx spray when DDT is used in cover sprays, definite conclusions cannot be drawn from the data. When lead arsenate is used in both calyx and cover sprays, the calyx spray is much more important than in schedules requiring the application of DDT in cover sprays. The greater efficiency of the latter insecticide during the period of fruit development tends to offset any losses which might be caused by the omission of a calyx spray. This is seen more clearly when it is remembered that considerable fruit shedding normally occurs early in the season and also that the first cover spray is invariably applied within three weeks of the calyx spray.

Woolly Aphid.

Many orchardists in the Granite Belt have recorded damage to their trees from severe woolly aphid attacks following the use of DDT for codling moth control. Though Granny Smith apples are not as subject to this pest as some of the earlier apple varieties, such as Delicious, only small aphid populations were present on the experimental trees. Throughout the season, the woolly aphid parasite* could be found on the trees, and though its incidence fluctuated to some extent, parasite activity was such that most of the aphids were destroyed by the end of the growing period.

Despite low populations of this pest, periodical observations throughout the summer and autumn revealed that hexaethyl tetraphosphate at the concentration used (1-1600) shows little promise of filling the role formerly occupied in the Granite Belt by nicotine sulphate. Higher concentrations of the insecticide with an efficient spreading material may prove more satisfactory.

Mite Control.

Following evidence of mite† injury on the experimental trees in early January, it was anticipated that damage would become extensive later in the season. However, the mild weather of late summer and autumn did not favour prolonged mite activity and only slight foliage injury developed.

The use of a pale oil-lime sulphur spray at bud burst had a marked influence on summer mite populations despite the subsequent use of DDT for both calyx and cover sprays. This semi-dormant spray proved far more effective in reducing mite populations in the trees than wettable sulphur or hexaethyl tetraphosphate applied at six-weekly intervals during summer. It is apparent that mite control should be undertaken prior to the onset of conditions favourable for mite development; the use of a dormant red oil or a semi-dormant pale oil against the overwintering stage of the mites is more likely to keep mite populations low in summer than is an acaricide applied when the trees are in full foliage and populations are dispersed over the leaves.

CONCLUSIONS.

Though the introduction of DDT into the spraying programme on deciduous orchards has greatly altered the outlook for codling moth control, further experimental work is necessary before the many problems that have arisen following its use can be solved.

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* *Aphelinus mali* Hald.

† *Bryobia praetiosa* Koch.

Further experimental work is planned for the 1948-49 season along lines suggested by the 1947-48 work. Pride of place must be given to two of the more outstanding problems at present facing growers, namely, the control of woolly aphid and a reduction in the number of DDT applications required for the control of codling moth.

RECOMMENDATIONS FOR THE 1948-49 SEASON.

Growers are advised to conform to the pest control schedule recommended by this Department early last season. The salient points of this schedule may be listed as follows:—

1. Orchard hygiene should always be an important part of the orchardist's pest control programme. Over-wintering larvae of the codling moth, both in the packing shed and in the orchard, should be systematically destroyed each year.

2. Either a red oil spray (1-20) as late as possible before bud movement, or a pale oil-lime sulphur (1-1-20) at bud burst, should be applied to destroy red mite and lessen the risk of injury from this pest when DDT is used later in the season.

3. Until further evidence is available concerning the merits of the calyx spray in DDT schedules, the standard lead arsenate calyx spray should be retained.

4. Either lead arsenate or an 0·1 per cent. DDT spray may be used, applications being timed in accordance with spray notices issued by the Department of Agriculture and Stock.

Woolly aphid and mite populations should be dealt with as they develop on the trees, the aphid with the standard white oil-nicotine sulphate spray (white oil 2½ pints, nicotine sulphate 1¼ pints, water 100 gallons) in place of one or more of the DDT cover spray applications, and the mites by substituting an oil spray (1-60) for one of the DDT cover sprays.

Control the Banana Weevil Borer!

J. A. WEDDELL, Entomologist, Science Branch.

BANANA planting operations take place in the spring and all growers, whether newcomers to the industry or those increasing their areas, should take all possible precautions against the banana weevil borer.* This insidious pest, if ignored, can easily become the factor limiting the success of the venture. For this reason it is essential that growers should familiarise themselves with the habits of the pest so that the control recommendations can be efficiently carried out.

Habits of the Insect.

The adult beetle is a hard, slender, black weevil about half an inch in length and it has a curved proboscis or snout. This is the free-moving stage of the insect, but it moves about only in dark places or at night. Normally it shelters by day in the soil, in rotting corms, or in cut stems and other debris lying on the ground.

* *Cosmopolites sordidus* Chev.

The eggs are usually laid into the corm, but occasionally they are laid into either the firm basal part of the stem of the growing plant or into any part of the spent stem after it has been cut away and is lying on the ground. When an egg has been inserted into the plant tissue, the small opening soon becomes sealed off; consequently it is impossible to detect the presence of an egg from a surface examination. The principal egg-laying periods in the year are spring and autumn, but some egg-laying takes place all the year round. Eggs hatch usually in about eight days but in the height of summer the period may be as short as four days.

The grub that emerges from the egg is small, soft and legless. It tunnels its way into the plant tissue, growing and feeding more voraciously as it gets older. In the spring it is usually full-grown in about six weeks, but in the summer the rate of growth is much faster and the grub becomes full-grown in about three-and-a-half weeks. The grub then transforms to a pupa and from the pupa the adult beetle emerges after seven days. The breeding of another generation then commences.

The Damage.

It will be seen that the freely moving adult beetle is responsible for new infestation from plant to plant. The egg stage is the one mainly responsible for the initial infestation of a new plantation if eggs are present in the suckers. It is the grub stage that causes the damage to the plants.

Damage to the plants can affect the plantation in three different stages. If the suckers for a new plantation are carelessly selected and not properly cleaned, then a poor stand will probably result. The grub from a single egg is sufficient to kill a sucker. If the growing plantation becomes infested when the plants are in bearing they will start to show the effects of damage. In dry weather, the plants may suffer from lack of vigour owing to a shortage of food reserves. In wet and windy weather, plants will collapse under the weight of the heavy bunches owing to the root failure and poor anchorage caused by corm destruction. If the attacks continue unchecked then the plants as a whole will become weakened, and first one stool and then another will deteriorate. Finally, the plantation that should have lasted several years more will have to be dug out altogether because it will not be profitable to work.

Keeping New Plantations Clean.

The first essential is to start off with clean planting material. To do this, the following points should be observed.

1. The transfer or purchase of banana-planting material is controlled by the Banana Industry Protection Board. The intending grower should make himself acquainted with the requirements of the Board by enquiry from the local horticultural officer of the Department of Agriculture and Stock.
2. The plantation from which suckers or other planting material are to be taken should be free, or nearly so, from banana weevil borer infestation.

3. Before the suckers are removed from the parent plantation they should be trimmed and pared. In paring the corm of the sucker a layer at least one-eighth of an inch thick should be cut away. By so doing any eggs that have recently been laid will be removed and destroyed in the parings. If grub tunnels are exposed then the sucker should be pared further. Of course, if mutilation is severe that particular sucker should be discarded.
4. The trimmed and pared suckers should be bagged immediately and removed from the parent plantation before nightfall, otherwise egg-laying adults may be attracted to the freshly cut surfaces and the work already done will be of no value.
5. All discarded suckers should be split and, with the parings and other debris, spread out to dry in the sun.

Once the new area is planted it may become infested by beetles wandering in from older adjacent or nearby plantations, for obviously the new plantation will usually be in a banana-growing district. It is therefore advisable to place out beetle-baits and these for convenience usually consist of lengths of cut stems. A piece of stem 18 inches long split lengthwise will provide two baits, which should be placed with the flat surface to the ground. As the suckers grow advantage should be taken of any shade so as to enable the baits to remain moist and attractive as long as possible. The baits should be examined frequently and any beetles found on them or on the soil beneath should be destroyed. Even a small number killed in this way can well repay the little extra time and trouble.

Control in a Bearing Plantation.

As soon as the plantation comes into bearing, advantage can be taken of the freshly cut surfaces of the corm which are exposed when cutting down the old spent stems and when desuckering. These freshly cut surfaces are most attractive to the beetles and they should be dusted with a poison mixture. The poison recommended is an arsenical compound known as Paris green and this is still strong enough to be effective when mixed at the rate of one part Paris green to six parts flour. This mixture should be dusted on to every freshly cut surface. In cutting down an old stem it is suggested that it be cut off at a convenient height, six inches or more above ground level. If the base is then chopped almost through near ground level the stump of the plant can be bent over so as to expose two cut surfaces. These should be dusted with the mixture and the stump of the plant then straightened. A small space will thus be left between two moist poisoned surfaces and this will form a very effective poison bait.

All old stems and excess suckers that have been removed should be chopped across, split lengthwise, and placed out in the open spaces between the rows so that they will dry out as soon as possible and cease to provide beetle harbourage.

Biological Control.

Considerable attention has been paid in Queensland to the possibility of biological control of the banana weevil borer. Over 20 years ago colonies of an Histerid beetle* were imported from Java and

* *Plaesius javanus* Er.

liberated. Again in 1928 further colonies of the same beetle and large numbers of a fly*, whose maggots are predaceous on the grubs, were imported and liberated. Unfortunately all of these attempts were unsuccessful. The beetles were found for a short period after liberation and then disappeared completely. The attempt to establish the fly was even less successful as the species was not seen again after liberation. Just before the war, another species of beetle, this time a Hydrophilid†, was imported from the Federated Malay States. This insect was successfully established in south coastal areas and from there it has been distributed to other banana-growing areas. There seems reason to believe that the insect is of some value but it has by no means solved the banana weevil borer problem.

New Experimental Work.

A great deal of interest has recently been taken by banana growers in the newer insecticides, of which several have been evolved during and since the war. DDT is foremost among these. It has been shown by laboratory tests that the adult weevil will die shortly after a brief contact with DDT. Experimental work with this and other new insecticides in several banana plantations is planned for the present season and this work may have to continue into the following season owing to the difficulty that may be experienced in assessing results. The general form of the experiment is that groups of plants in the chosen infested areas will be marked. Some will then be sprayed with DDT at a strength of 0·4 per cent., that is, four times the strength that is normally used on cultivated plants. Two other new insecticides will also be included in the trials. The sprays are to be applied to the basal parts of the plants and to the surrounding soil. One application will be made in the spring and subsequent applications will be made as occasion seems to warrant, and they will probably be timed at least for summer and autumn. These details are given so that growers may know what experimental work is in progress, but it must be clearly understood that positive recommendations along these lines are not possible until the experiment is finalised.

Pending the results of the experimental work, growers are urged to carry out the baiting and other recommendations given in this article.

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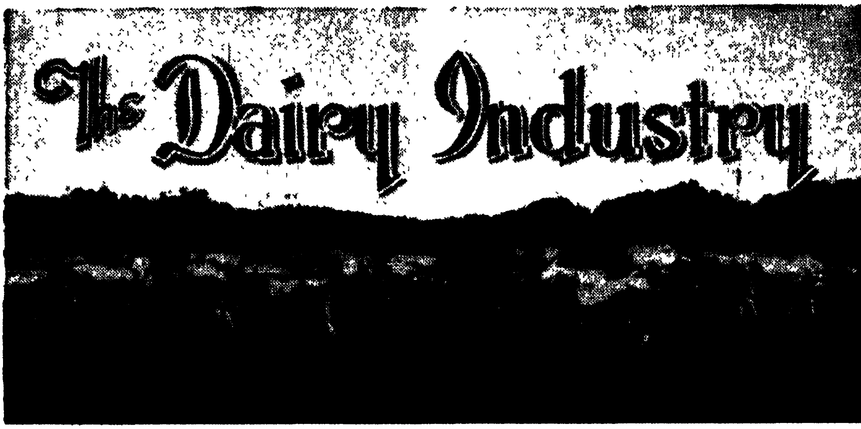
* *Chrysopila ferruginosa* Wied.

† *Dactylosternum hydrophiloides* McLeay.



Why Cream Tests Vary.

Prepared by DIVISION OF DAIRYING.

VARIATIONS in butterfat tests of cream supplied to butter factories are often a source of concern to dairymen. It is almost universally felt that, since the milk is drawn from the same herd, fed and milked in the same manner, and separated under identical conditions from day to day, there should be no variations in the factory butterfat tests of cream. Any variation is regarded with suspicion and the method of testing at the factory usually becomes the butt of criticism. Great care is certainly necessary in sampling and testing cream if the results are to be correct, but variations are bound to occur in tests, as so many factors affect the process of separation of cream from milk serum.

PHYSICS OF SEPARATION.

In the separator, force is used to bring about the separation of the cream from the milk serum. The simplest definition of "force" is that it is a push or pull—for example, the force of gravity tends to attract (or pull) all matter to the centre of the earth. The specialised force made use of in the common separator is known as centrifugal force. The term centrifugal force is used to describe that force which causes a body revolving round a central point to fly from the centre. When a car negotiates a curve at a considerable speed the passengers find themselves crowded up against the outside cushions due to the action of centrifugal force. The cushions, by pushing inwards, ensure that the passengers take the desired curve path through space. Roads are banked on curves to counteract the centrifugal tendency and thus ensure that the car takes the desired course.

Centrifugal force can be harnessed to act upon liquids as well as upon solids.

PRINCIPLES OF SEPARATION.

The separation of cream from milk serum in the centrifugal cream separator is thus based upon the principle *that when liquids of different specific gravities revolve around the same centre, at the same distance and with the same speed, a greater force is exerted upon the heavier liquid than upon the lighter.* Thus, in the case of milk, the milk serum will be subjected to a greater centrifugal force than the fat particles, with resultant separation of the two phases.

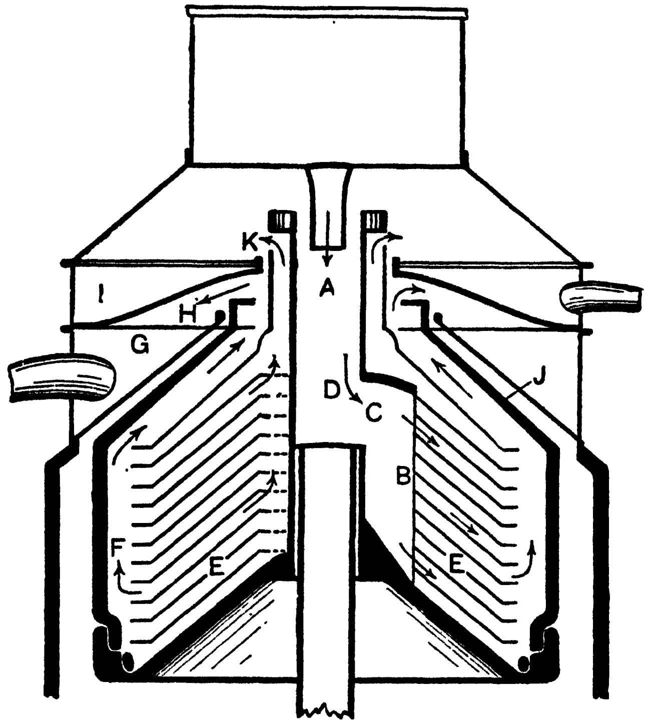


Plate 46.
SECTION OF THE UPPER PORTION OF A SEPARATOR.

(A) Milk inflow.
(B) Opening in projecting wing.
(C) Projecting wing.
(D) Hollow shaft.
(E) Skimming-discs.
(F) Circumference of bowl.
(G) Skim-milk pan.
(H) Inlet to skim-milk pan.
(I) Cream pan.
(J) Bowl hood.
(K) Inlet to cream pan.

The skimming discs aid in the separation of the two phases by braking the centrifugal tendency possessed by the rotating milk just long enough to permit thorough separation of milk serum from fat particles, which takes place about one-third of the way down the discs in a region known technically as the zone of separation. The skimming discs are thus designed to balance a certain centrifugal force; this is the reason for the conical shape and special angle of incline of the sides (see Plate 46). If the maker's instructions are ignored and the speed of the separator varied at will, then the machine cannot be expected to do its work efficiently. Low speeds will develop insufficient centrifugal force and thin cream results. High speeds develop excessive pressure on the sides of the separator bowl, which is normally of the order of tons per square inch, and so may threaten injury to the machine.

FACTORS AFFECTING VARIATIONS IN CREAM TESTS.

Position of the Cream Screw.

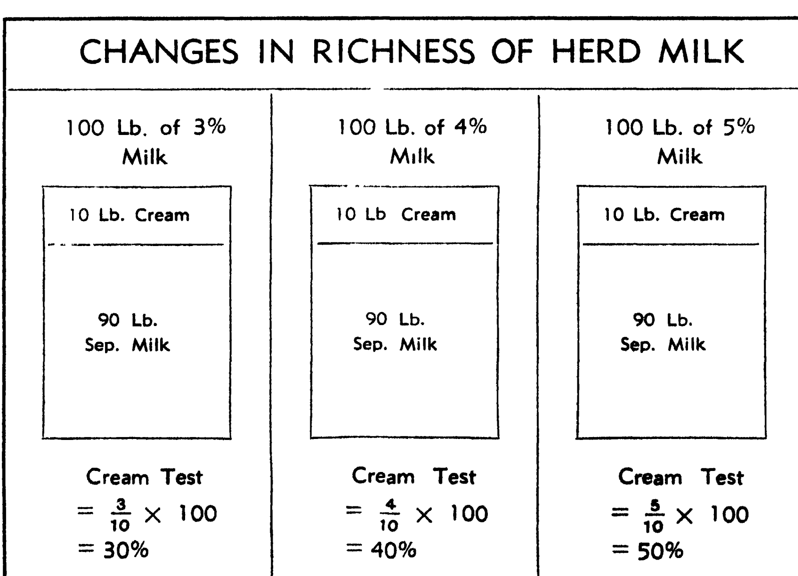
Fundamentally, the richness of cream obtained from a separator depends upon the regulation of a device known as the "cream screw." While many factors may be regarded as contributing to a particular test of cream, the cream screw is responsible for securing either a rich or a thin cream. Tampering with the cream screw is bound to cause fluctuations in the fat test. The cream screw should not be changed unless the cream test is consistently showing either too high or too low a reading. The legal standard for cream requires that the cream should contain not less than 34 per cent. of milk fat during the months April to September, and 38 per cent. during the months October to March (inclusive). The percentage of butterfat specified is a minimum and the ideal percentage can only be ascertained by taking into account local conditions, seasons, and the general conditions under which the cream is produced.

Changes in the Richness of Herd Milk.

These changes may be brought about by some cows drying off and fresh cows coming in. When this is so, there is a tendency towards a drop in the richness of herd milk and a corresponding drop in the test of the cream. The addition to or taking out of the herd of cows producing high- or low-testing milk will also influence the test. It will be raised or lowered accordingly.

Since during the process of separation practically all of the fat goes into the cream, the cream obtained from the separation of rich milk will contain more fat than that obtained from the separation of poor milk.

DIAGRAM 1.



Once the cream screw of the separator has been set, the separator will always deliver a definite ratio of separated milk to cream so long as all other conditions remain normal. Suppose the ratio be 90 to 10. Then, for every 100 lb. of milk separated, 90 lb. of separated milk and 10 lb. of cream will be discharged. Thus, irrespective of the richness of the milk put through the separator, this ratio will be maintained.

. The relationship of the cream test to the richness of the milk separated may be represented as in Diagram 1.

Speed of the Separator Bowl.

The efficient operation of a separator of any make depends upon the centrifugal force generated by the speed of the bowl. As mentioned previously, the manufacturer's instructions relative to the speed of operation must be rigidly adhered to, otherwise the fixed skimming discs which are specifically designed to balance a certain speed of rotation will not perform their function properly. A higher speed than that indicated tends to increase the capacity of the separator for milk and causes the flow of a comparatively richer cream. As increased revolutions per minute may seriously injure the machine, no beneficial results can accrue from working at too high speeds. Operating at a lower speed than that indicated by the maker gives a proportionally larger volume of cream which will be lower in its butterfat content. In addition, low speeds are usually responsible for considerable losses of butterfat in the separated milk.

These factors can be represented graphically as in Diagram 2.

DIAGRAM 2.

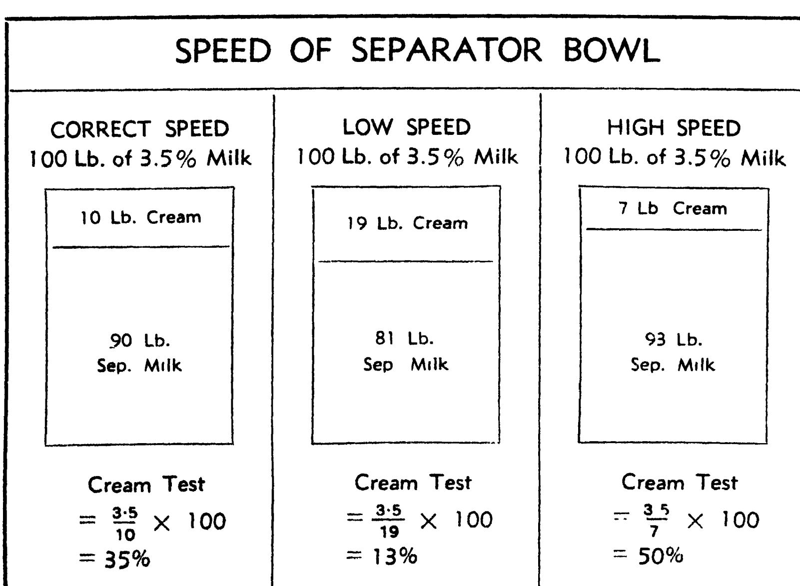
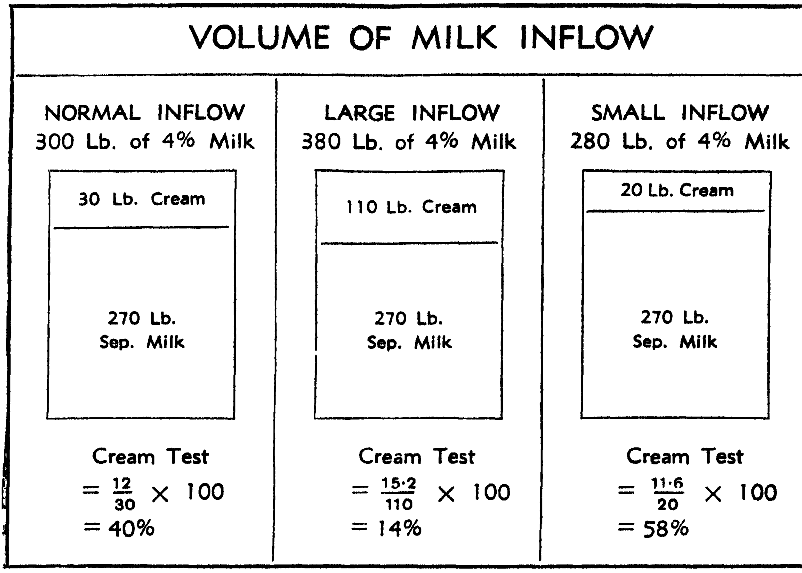


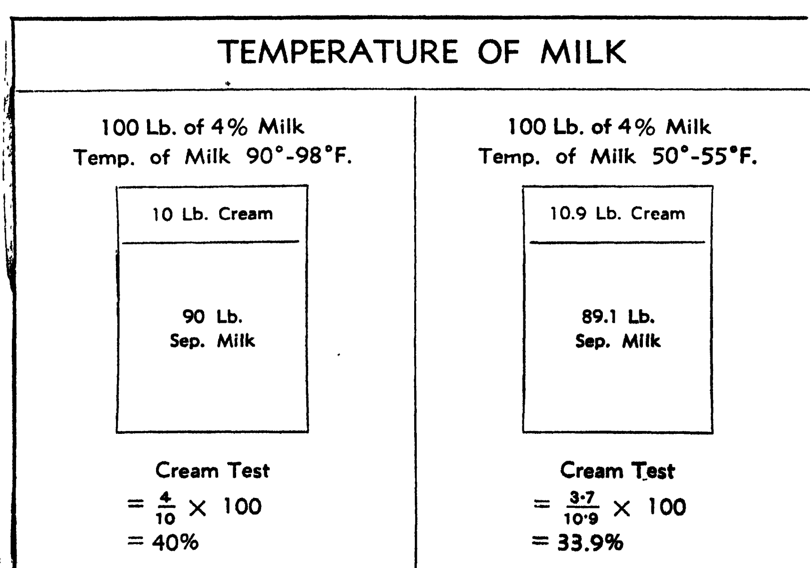
DIAGRAM 3.



Volume of Milk Inflow.

The richness of cream obtained from a separation varies inversely as the rate of milk inflow. Every separator has a rated capacity and any attempt to alter it may have serious consequences. Forcing the milk through in excess of capacity tends towards the production of a thinner cream than that of the normal inflow, while a reduced inflow of milk, other things being equal, gives a thicker cream. The effect of the rate of inflow on the cream test is illustrated in Diagram 3.

DIAGRAM 4.



Temperature of Milk.

Warm milk separates more completely than cold. A temperature between 90 degrees and 100 degrees Fahr. is regarded as more or less ideal. Hence the milk is in the best condition for separation in every respect immediately after each milking—that is, when it is "cow warm." Variations in cream tests due to separating milk at incorrect temperatures are quite common but not as significant as those due to operating the separator at incorrect speeds. The maximum variations observed are of the order of about 4 per cent. The influence of temperature upon the efficiency of separation is shown in Diagram 4.

Condition of Milk.

Milk, as it comes from the cow, after thorough straining is in the best condition for separation; it is then in a high state of fluidity, and at the right temperature. Sour or curdled milk separates with difficulty or not at all. Souring definitely does not increase pounds of butterfat. Slightly sour milk, or milk that has creamed, should be well stirred before it is allowed to enter the bowl. In practice, such milk should be slightly underfed to the separator.

Amount of Water or Separated Milk Used to Flush the Bowl.

Opinions vary considerably as to both the wisdom and the economic benefit of this practice. However, with many farmers, flushing the bowl and the inclusion of the results of flushing with the bulk cream are a firmly established part of separating routine. It is axiomatic that any variation from time to time in the quantity of water or separated milk used in flushing the bowl at the completion of the separating process will have a marked effect upon the test of the cream. A variation of one pint in the amount of flushing fluid may influence the test of the cream, the actual percentage depending upon the amount of cream obtained. In addition, the texture and keeping quality of the cream may be considerably affected by the method of flushing. If the flushing fluid is added at a greater rate than the separator can cope with, a deal of the non-fatty solids which are regarded as the poor keeping constitutents of cream may become mixed with the cream. Keeping quality will consequently be threatened.

Smooth Running.

The separator must run smoothly; otherwise, the layers of fluid in the separator, instead of arranging themselves in correct order—the cream at the centre and the separated milk at the outside of the bowl—are broken up and mixed by the vibration. As long as the separator is running smoothly, efficient separation takes place and the cream and separated milk make their way to their respective outlets without interference. Experiments have shown that five times as great a loss of butterfat in the separated milk have been experienced when a separator is operating under adverse conditions as when it is operating satisfactorily.

Cleaning of Separator.

Butterfat losses in the separated milk are greatly increased by operating a separator with an unwashed bowl. Therefore, not only from a hygienic point of view, but also from an economic viewpoint, regular washing of the separator is essential.

Conditions under which Cream is Stored.

If cream is held under conditions which permit the evaporation of moisture—for example, in an unsealed can at a high temperature—there will be a corresponding shrinkage in volume and an increase in the fat test. However, pounds of butterfat are unaltered.

Summary—Why Cream Tests Vary.

1. Cows: Changes in richness of herd milk.

2. Separator:—

   (i.) Tampering with cream screw will cause large variations in cream tests.

   (ii.) High speed, low rate of milk inflow, and low temperatures increase the test but produce less pounds of cream.

   (iii.) Low speed, high rate of milk inflow, and high temperature of milk decrease the test but produce more pounds of cream.

   (iv.) Lack of smooth running.

   (v.) Unclean separator bowl.

3. Storage of Cream: Test may be increased by evaporation of moisture. Pounds of butterfat are unaltered.

How to Prevent Variations in Cream Tests.

1. Set the cream screw to deliver the desired richness of cream. The desired richness is outlined in the *Dairy Produce Act* as follows:—"Cream intended for supply to a butter factory during the months of April to September, inclusive, shall contain not less than thirty-four parts per centum of mik fat, and during the months of October to March, inclusive, not less than thirty-eight parts per centum of milk fat."

2. Once the cream screw has been set, do not meddle with it.

3. Run the separator at each skimming uniformly at the proper speed.

4. Use the correct rate of milk inflow with the milk at the proper temperature—"cow warm."

5. If flushing the separator bowl is the general practice, use the same quantity of warm water or separated milk at each flushing.

6. Make sure the separator bowl is running smoothly.

7. Thoroughly clean the separator after each separation.

8. Cool the cream and store in a refrigerator or cooler.

Copper Deficiency of Sheep in Queensland.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

IN August, 1945, an inspection was made of wool which was being shorn from some sheep depastured in north-western Queensland and it was considered that this clip showed a fault characteristic of copper deficiency. Subsequent research work carried out conjointly by C.S.I.R. and the Department of Agriculture and Stock confirmed this suspicion and revealed that there were some extensive but fairly well-defined areas where a copper deficiency of sheep occurs. These embrace a large portion of the sheep grazing lands east and south-east of Cloncurry, the northern part of the valley of the Flinders River, the Roma-Muckadilla area, the Warwick-Stanthorpe district and around the Gums and Tara.

The purpose of this article is to acquaint graziers with the symptoms and the correction of the trouble.

Utilisation of Copper by Plants and Animals.

Copper occurs in the soil and during their growth plants take up minute quantities. Various factors influence the amount of copper in the plants. Of these the amount of copper present in the soil, presence of other elements, the acidity or otherwise of soil, plant species and stage of growth are amongst the most important.

When the plants are eaten some of the copper is absorbed into the bloodstream during the normal process of digestion, and it is later stored in the liver. Though the amount of copper required is extremely small, it has a vital function in the formation of the protein molecules which make up the wool fibres. When there is insufficient copper in the plants to keep abreast of the rate at which the copper is utilised by the animals, supplies are drawn from the liver stores. When these are exhausted symptoms of copper deficiency may become obvious.

Symptoms of Copper Deficiency in Sheep.

The symptoms produced by copper deficiency depend upon the age of the animal. In adult sheep the most noticeable indication is in the wool and the changes which occur are quite definite.

The normal character, as indicated by the crimp of the wool, is lost and in cases where the deficiency is at borderline level large "secondary waves," which appear to be superimposed on the crimp, occur. Plates 47 and 48 show typical cases.

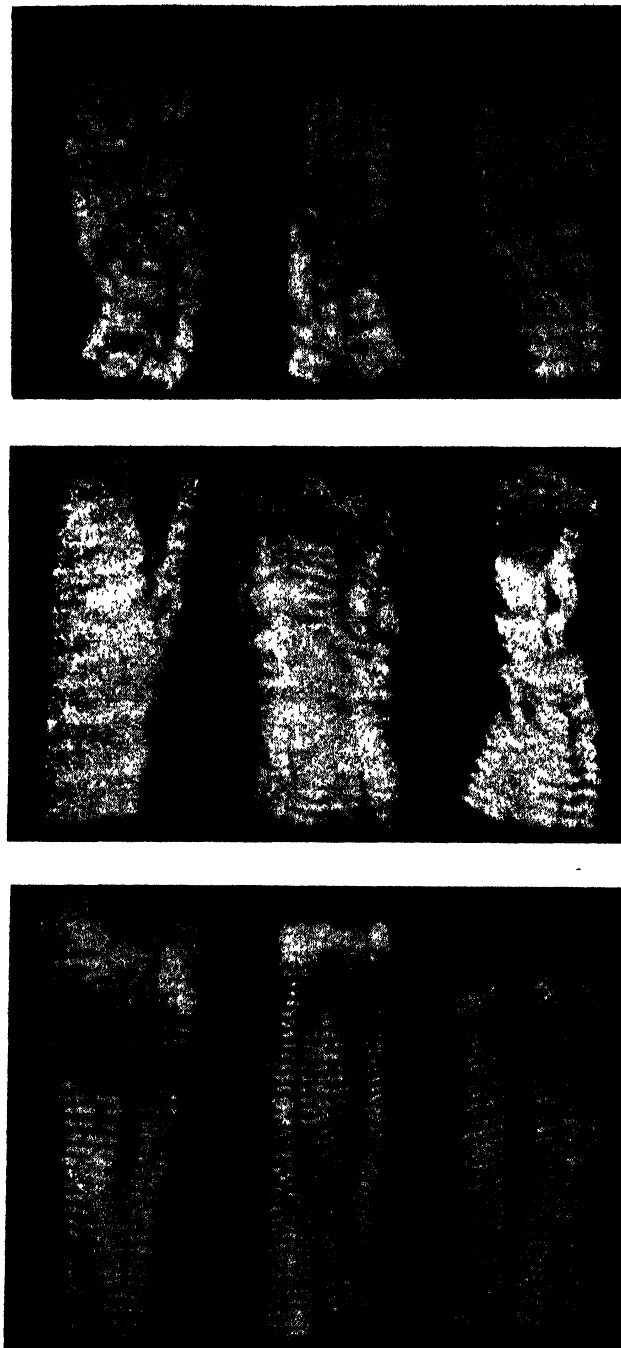


Plate 47.

EFFECT OF COPPER DEFICIENCY ON WOOL.—Lower tier is of normal fleeces, middle tier of slightly affected fleeces, and upper tier of badly affected fleeces.

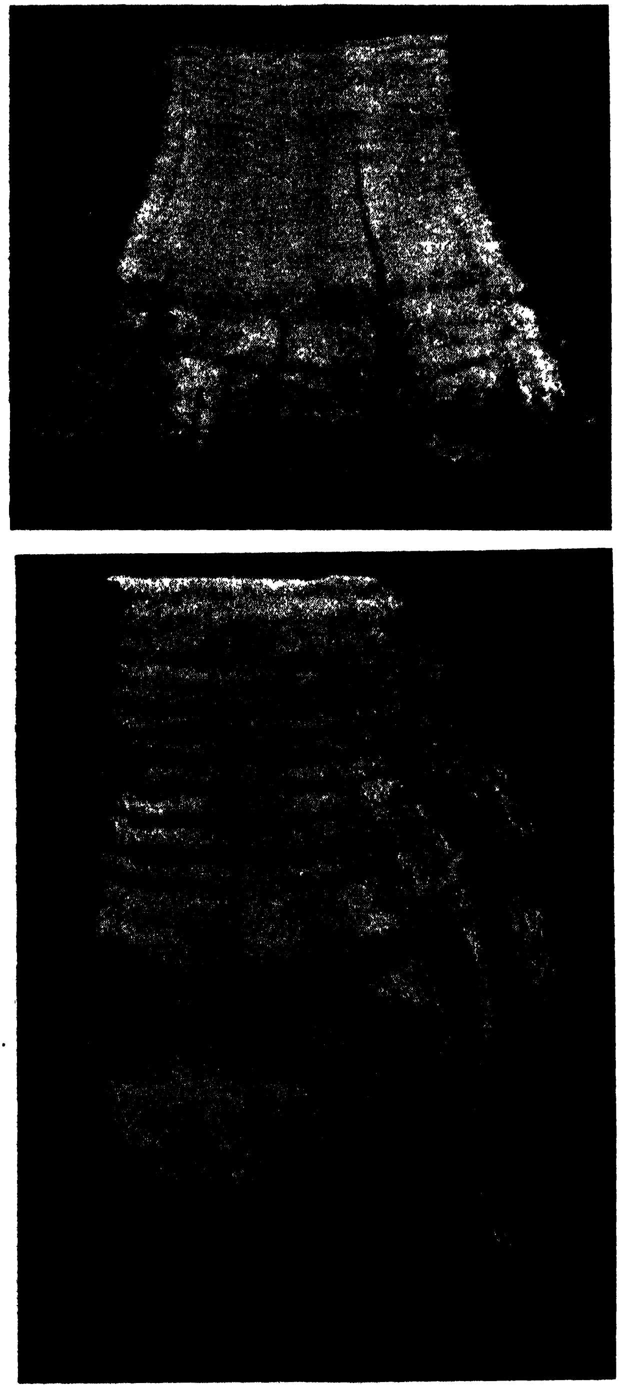


Plate 48.

Wools from Merino and Crossbred Sheep in which the Beneficial Effect of Copper Treatment is Apparent.

If the deficiency is accentuated the abnormality is more marked, and in extreme cases of deficiency the wool is referred to as "steely," "stringy" or "silky." Probably "silky" is the most descriptive single term, as the crimp has almost completely disappeared, though there may be some indefinite waves and the wool has a typical glassy sheen, sometimes referred to as a "galvanised shine." The handle is soft and slippery and the general impression is that the affected wool has no "guts." Such fleeces are not usually sound; when the whole length of the staple is affected there is no definite break but the wool is more inclined to be "rotten"; that is, the staple can be broken anywhere.

One interesting feature which must be borne in mind is that the abnormality in the wool will only occur in that part of the staple grown during the time in which there is insufficient copper to meet the demands of the sheep and after the liver stores have been exhausted. Typical "silky" wool has been seen on previously good-woolled stud rams some time after their introduction from sound country to copper-deficient areas. When these animals have been returned to sound country the wool has become normal again.

One of the most outstanding demonstrations of the importance of copper in the development of normal wool character is to be seen in Plate 48, which shows the wools from a Merino and a crossbred sheep. These animals were introduced into a copper-deficient area and after three months were shorn. The new wool showed typical "secondary waves" and these are clearly seen towards the tip end of the staples. Six months after shearing the animals were drenched at frequent and regular intervals with bluestone solution; the remarkable change in the wool is obvious from Plate 48. Adult sheep run on deficient areas are inclined to be a little unthrifty, though there are very few definite signs apart from the changes in the wool.

Some interesting observations have been made on black sheep running on country where white sheep show signs of copper deficiency. These animals showed intermittent white bands along the length of their black staples and there was a strong correlation between the occurrence of these white bands and the appearance of changes typical of copper

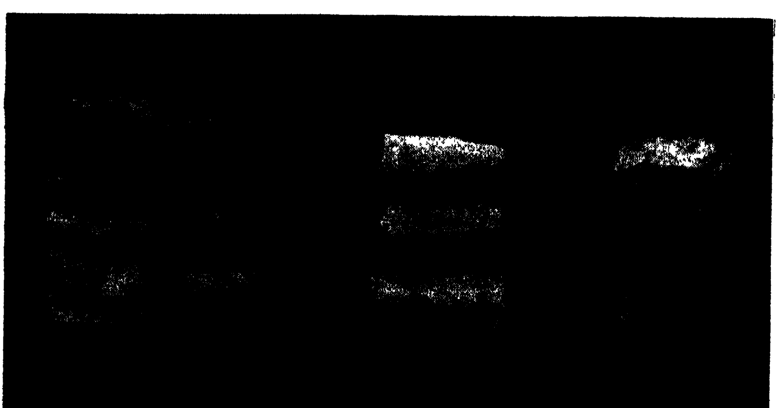


Plate 49.

WOOL FROM BLACK SHEEP WITH WHITE BANDS PROBABLY CAUSED BY COPPER DEFICIENCY.

deficiency in the wool of white sheep. In addition, when the animals were given copper drenches, the black pigment returned immediately to the wool of a black, banded staple which was growing white wool (see Plate 49).

If weaners are subjected to a copper deficiency they produce abnormal wool, their general growth and development are slow, and they give the impression of being stunted and poorly grown. Eventually they may grow into reasonably good sheep, though they are inclined to lack the substance and size of animals grown on sound country. If ewes are subjected to a serious copper deficiency during the latter stages of pregnancy, and if their copper status does not improve soon after lambing, a peculiar set of symptoms, followed by heavy mortalities of the lambs, may occur.

Lambs one to two months old are most commonly affected. The first signs are a check in growth rate and a tendency for the lambs to become unthrifty. If the lambs are driven for half a-mile or so they begin to stagger and lose control of their hind limbs. Further forced exercise will accentuate the condition and within a few days of first being noticed the affected animal is capable of travelling only short distances. If attempts are made to force these lambs along they show an exaggerated back leg action and knuckle over at the pasterns; their hindquarters sway, and finally they go down. If left alone the affected lambs will get up again after a short rest but will be incapable of travelling very far. The disease may progress rapidly and the forelegs may become affected. At this stage the lambs lie about in the paddock and are unable to rise. Their appetite is maintained, however, and they will crop all grass within reach and appear bright and alert. Death usually occurs as the result of the activity of predators—foxes, eagle hawks, &c.

If the lambs do not develop the disease until they are three or four months old the course is generally much less severe. There is a check in growth rate and the abnormal swaying gait only becomes apparent when the sheep are driven (Plate 50). Such lambs often survive.

Plate 50.

LAMBS SHOWING SYMPTOMS OF COPPER DEFICIENCY.

Overcoming a Copper Deficiency.

Before attempting to treat any disease condition in livestock it is first necessary to obtain a correct diagnosis as to its nature.

The diagnosis of a copper deficiency in sheep is based upon—

1. The occurrence of abnormal wool;
2. The clinical appearance and history of the sheep;
3. Chemical analysis of the liver and/or blood.

Obviously the carrying out of this work calls for close co-operation between those who produce wool, prepare the wool for sale and handle the clips at sale time, and the technical services which are available on application to the State Department of Agriculture and Stock. Wool samples may be submitted to the Department's Sheep and Wool Branch and where necessary investigatory follow-up work will be undertaken.

Copper deficiency is easily overcome by arranging a small regular intake of copper. The exact method chosen will depend upon the circumstances. In areas where worms occur it is a simple matter to give sheep additional bluestone (copper sulphate) when drenching. A stronger drench administered four times a year will, in most cases, allow the sheep to lay down sufficient copper in their liver stores to meet daily requirements. Details of this treatment may be obtained on application.

In areas where salt licks are fed the bluestone (copper sulphate) can be incorporated in the lick at the rate of ½ *lb. per* 1,000 *sheep per week. This level of bluestone supplementation must not be exceeded because of danger from copper poisoning.* The easiest way of getting an even distribution of the bluestone (copper sulphate) is to dissolve it in a small quantity of water which can be sprayed over the salt lick during mixing.

The disadvantages of using a cuperised lick are—

(1) The expense and labour involved;

(2) The copper intake of a whole flock is erratic and some sheep, probably 25 per cent. of an average flock, will not take licks;

(3) The danger of chronic copper poisoning, which may result from salt-hungry animals eating too much.

In some districts where drenching is not undertaken and where salt licks are not fed it is possible to give the sheep copper through their drinking water, but this is only practicable where the water is distributed through troughs. To be successful, this method must allow for a fairly continuous supply of bluestone (copper sulphate) in the drinking water and this is often difficult to attain because—

(1) Bluestone (copper sulphate), even in the most dilute solutions, has a corrosive action on iron and for this reason cannot be added to the supply tank and can only be placed in concrete troughs, unless the supply tank is made of concrete. If the bluestone (copper sulphate) is added to the water in the trough it may dissolve readily and, if the first sheep in for water drink the trough empty, the remainder of the flock do not get their quota of copper;

(2) Some waters, particularly those which make very black tea, contain chemicals which deposit the copper in an insoluble sediment on the bottom of the trough.

The first difficulty can be overcome by the use of small copper or muntz metal cylinders about 18 inches long and 1½ inch diameter. One end of the cylinder is closed and a very small hole (about 3/64 inch in diameter) is drilled about 1 inch from the closed end of the cylinder. A small piece of brass or copper gauze is folded and placed in the bottom of the cylinder so that it extends to above the level of the small hole. The cylinder is supported in the trough near the float valve (see Plate 51) and the requisite amount of copper for a week's supply for the

Plate 51.

SHOWING CYLINDER FOR FEEDING BLUESTONE INTO DRINKING WATER.

sheep in the paddock, calculated at the rate of 8 oz. per thousand per week, is added to the cylinder. The water which enters the cylinder through the small hole becomes saturated with bluestone (copper sulphate) and gradually finds its way out of the hole. Additional bluestone (copper sulphate) is added each week. The preferable method is to have duplicate cylinders for each trough. The weekly amount of bluestone (copper sulphate) to be given to the sheep in any one paddock is weighed out and placed in the spare funnel. When the troughs are visited as part of a routine inspection, the funnel containing the copper can be placed in the trough and the empty cylinder withdrawn and after recharging with bluestone (copper sulphate), can be replaced in the trough at the end of the next week. This regular interchanging of cylinders means that a constant check is kept on the amount of copper which is getting out to the sheep and on the small holes near the bottom of the cylinder, which can be inspected for blockages.

The whole success of this method depends on the chemical content of the water being used, and it is advisable to consult the Department of Agriculture on this point.

The disadvantages of supplementation through water are—

(1) When alternative sources of surface water are available the sheep will often prefer them and not return to the troughs until forced to by dry weather;

(2) It is limited in its application to water distributed through troughs and these should preferably be concrete.

An indirect benefit derived from the addition of minute amounts of bluestone to the drinking water is that it prevents the development of the green slime (algae) so common in water troughs.

The fourth method of overcoming copper deficiency is topdressing of the country with finely ground bluestone (copper sulphate) at the rate of from 4 to 7 lb. per acre. This can be quite effective where the soil is deficient in copper, but the final success of topdressing depends upon the capacity of the indigenous plants to take up more copper and this is governed by a number of factors, included amongst which are the species of the plants, the presence of other minerals, and the acidity or alkalinity of the soil.

Chronic Copper Poisoning.

Woolgrowers are warned that it is dangerous to spread bluestone around in an indiscriminate manner. The daily intake of a greater amount of copper than is required to maintain the normal health of the sheep may produce chronic copper poisoning, with consequent heavy mortalities.

Plate 52.

AERO WEIR, NEAR AMBERLEY, MORETON DISTRICT.

The Beef Cattle Industry in the Far West.

J. C. J. MAUNDER, Chief Inspector of Stock.

(*Continued from page* 114, *August*, 1948.)

DISEASE PROBLEMS.

The entire area is remarkably free from all diseases of economic importance. This would be due partly to the fact that the country is very lightly stocked, and partly to the fact that most of the country is very open and exposed to blazing summers of dry and intense heat.

Cattle Diseases.

As the majority of the cattle in the area originate in the Territory, one would expect to find that contagious pleuro-pneumonia was not uncommon on the Georgina and Diamantina. Actually this is not so, and, though there must be numerous "carriers" introduced from time to time, it would appear that outbreaks of "pleuro" are rare. Certainly there is no evidence of preventive inoculation that would suggest that outbreaks do occur and it must be accepted that pleuro-pneumonia outbreaks in this country are not common.

Tuberculosis must also be practically non-existent as there is no evidence that any properties have been troubled by condemnations at the works for this disease.

Actinomycosis does exist, no doubt, but nevertheless not a single case was observed amongst the many thousands of cattle, in mobs and otherwise, that were seen.

Blight does not seem to worry the cattle as much in this country as elsewhere; one particularly misses the nasty eyes that are so common in some cattle in other districts.

Worm infestation must be negligible, judged by the flourishing, thrifty appearance of all calves.

Poisonous plants are conspicuous by their absence. There is probably no other similar wide expanse of country anywhere in this State that is so free from poison plants. There is a little native tobacco

and a little caustic vine, but apparently cases of mortalities in travelling cattle are extremely rare. On stock routes, there are no plants which have the reputation of being dangerous to cattle.

Bone-chewing, botulism and associated conditions are absent.

Disease of Horses.

Strange to say, the country does not seem to be so kind to horses as it is to cattle, and horses do not present the sleek appearance of the cattle. However, bone and hoof formation seem to be excellent.

Birdsville disease is responsible for considerable losses, though it appears to be spasmodic in incidence. The general opinion of people in the country indicates that the disease is more prevalent in the sandhill country than elsewhere. There is evidence to suggest that cases appear amongst horses when they are confined to horse paddocks in the sandhill country. Release from the horse paddocks (a horse paddock would be thousands of acres in extent), allowing freer range in flooded downs or channel country usually results in cessation of cases. No sick horses were seen, and no opportunity arose to examine viscera, but it is possible that infestation with red worms (*Strongylus* spp.) may have greater significance in the cause of this disease than is generally believed. It would appear to be quite definite, however, that typical advanced cases of the disease do respond in spectacular fashion to phenothiazine treatment. The manager of one property on which the incidence of the disease has always been high is quite satisfied that phenothiazine has solved his problem of Birdsville disease. His method is to bring in to the station any horse showing symptoms, teach it to feed with bran mashes, and administer ¾ oz. phenothiazine followed by ¾ oz. the next day. This man claims rapid recovery, even in cases where complete inco-ordination of movement has developed.

It is intended to take every opportunity to pursue investigations that may clarify the role played by helminth infestation in the occurrence of Birdsville disease.

Miscellaneous Diseases.

Although, with the exception of Birdsville disease, diseases of livestock are of small economic importance in the area, the stock around the station—namely, station poultry and dogs—are not so well off.

Tick fever in poultry is responsible for considerable mortalities and some extremely heavy infestations of *Argas persicus* were noted, despite the fact that due precautions in the way of suspended iron perches and galvanised-iron houses were taken.

Filariasis in dogs appears to be common, and, though no post-mortem examinations were performed, some typical cases of "heart worm" were observed amongst the station dogs. Incidentally, dogs are not used in this country as working units in handling cattle.

The brown dog tick (*Rhipicephalus sanguineus*) is fairly common and causes intense worry to the dogs on some stations. In these cases, people were advised how to control and eradicate infestations using DDT preparations.

PESTS AND THEIR CONTROL.

The depredations of pests such as brumbies, dingoes, and grasshoppers are at times considerable, and much expenditure is incurred in attempts to control the first two.

Brumbies.

These are present in fairly large numbers, do considerable damage to watering facilities and are always to be found on the best feed. When it is realised that they exist literally in thousands, the loss of potential fat cattle will be appreciated. Generally of poor quality, they are not worth running for stock horses, though occasionally this is done by an individual stockman if he happens to sight a brumby that appeals to him. To be of any use for work, it is preferable to remove the captured brumby from its home territory, otherwise it will eventually break away and go back to the mob.

Brumby shooters are employed on most properties at the rate of 5s. per head for each brumby shot, the shooter taking the hair from mane and tail and the station providing the ammunition. It is not uncommon for these shooters to account for 1,000 brumbies on a single holding in one year. By this method, brumbies can be kept under control, but unfortunately not all holdings deal with the menace with sufficient vigour and brumbies continue to breed and multiply. They are more numerous in the sandhill country than in the open downs.

Dingoes.

The dingo population seems to fluctuate considerably from season to season. In early 1947 they did not appear to be plentiful in the cattle country of the Georgina and Diamantina. Stations are not therefore obliged to take very active measures to destroy them. Doggers employed by local authorities work through the area, trapping and poisoning, relying more on the former for their dogs. Aerial baiting of the area has been commenced, but it may take some years before the value of this method of control can be assessed. From general observations, it would not appear that dingoes cause anything like the losses caused by either brumbies or grasshoppers.

Grasshoppers.

There is no doubt that these operate in plague proportions over a considerable area, precipitating drought conditions on some holdings. Along the Diamantina channels, grasshoppers reached plague proportions in February and completely wiped out in a month channel feed that would have carried on until at least June. This had the effect of creating acute shortage of feed, decreasing the number of fats that could be turned off and forcing a drastic reduction in stocking. Station gardens were completely wiped out. Efficient control measures would be extremely difficult; but the economic importance of the pest certainly warrants particular consideration.

Miscellaneous Pests.

Rabbits and wild camels have at times been prevalent in the lower reaches of the rivers, but appear to be practically non-existent at the present. One lone camel was observed, and no rabbits. There are various theories advanced to account for the decline of the rabbit; some people say that they were wiped out by a record flood about eight years ago, others believe that a series of dry years accounted for the decline.

Wild donkeys have also been fairly prevalent, but now neither rabbits, wild camels, nor donkeys are of any importance.

STOCK MOVEMENTS.

There are heavy, seasonal movements of cattle into, through, and out of the area.

Movement of Stores.

Stores come from the Territory on to properties for fattening, or through them en route to properties on the Cooper and in southern Queensland and New South Wales. There is also some movement of stores into South Australia.

Stores moving in for fattening mainly originate on Alexandria, Brunette, Austral Downs and Avon Downs, and cross at Lake Nash. All are inoculated against contagious pleuro-pneumonia, either before starting on the road or at Lake Nash, where they take the final clean dipping before crossing.

The Inspector at Lake Nash permits the cattle to the Inspector at Boulia and from there they are permitted to the property if within the Boulia police district, or on to the Inspector at Bedourie for permit to the property within that police district. These Inspectors do not inspect all mobs prior to issue of permits.

The route to be travelled is determined mainly by the feed and water position. Generally, the stores moving to properties on the Georgina follow the main Georgina stock route from Lake Nash through Urandangie and Boulia and thence down the Georgina. An alternative route is from Urandangie to the Wills at Dajarra and then down the Wills and the Burke into Boulia, thence down the Georgina. Stores for Coorabulka and Springvale use the same routes to Boulia, and thence direct by their respective routes.

Stores for the Diamantina follow the same routes to Boulia; they may then come through Springvale to the Diamantina, and then down the main Diamantina route. An alternative route from Boulia is on the Georgina to Bedourie, thence to Cluny and to Monkira on the Diamantina, then up or down the Diamantina, as the case may be.

Store cattle travel in mobs of from 1,200 to 1,800, the average being in the vicinity of 1,500, and aim at covering approximately 60 miles per week.

When dry conditions are threatening, there is considerable movement of stores, cows, and calves out of the area, these having been purchased for stocking elsewhere or are being moved to other properties controlled by the same interests. According to the state of the routes and destination, movement is mostly down the Georgina, to cross into South Australia at Birdsville, down the Georgina to Bedourie, thence to Monkira to Currawilla and on to New South Wales.

Reference to these store movements demonstrates that many thousands of stores are moving in this area, with main junctions at Boulia, Bedourie, Monkira, and Currawilla. Anything from 20,000 to 40,000 cattle would pass through each of these places annually.

Movement of Fats.

Fats from the upper reaches of the Georgina usually travel to Butru by the Wills route, for trucking to Townsville. Alternatively they may go to Boulia, thence by the main Boulia-Winton route for trucking at Winton for Townsville. The lower Georgina fats may travel down the Georgina, cross at Birdsville and truck at Maree for Adelaide, or may go via the Cluny-Monkira-Currawilla route for trucking at Quilpie for Cannon Hill, or New South Wales works.

Fats from the upper reaches of the Diamantina usually go via the Diamantina route for trucking at Winton. From the lower reaches they go usually to Quilpie for trucking, but occasionally down the Diamantina to Birdsville for trucking at Maree.

The average mob of fats would be in the vicinity of 500 and they travel at the average rate of approximately 7 to 8 miles per day.

Seasonal Incidence of Movement.

Stores from the Territory start to move in about the end of April and the movements continue until the end of July in normal seasons. The commencement depends to some extent on conditions in the Territory. Sufficient time must elapse after the finish of the wet season there to allow mustering to be completed, pleuro inoculations to be carried out and the mob started on the road.

Fats start to move out from the middle of June and would be practically finished by the end of August. The actual time of movement is governed to a certain extent by methods of station administration in relation to the financial year; some prefer to move fats off before July 1 and some after that date.

The movement of cows and calves and stores to relieve stocking rates usually takes place during June and July. By that time the signs of difficult times ahead would be manifested and movement must be completed before the state of stock routes renders it impossible.

Drovers and Droving Hands.

It would appear that there is no shortage of exeprienced drovers, but there does seem to be a difficulty in obtaining drovers' hands. Many drovers have to undertake long trips with a shortage of men, while in other cases the men they do get are inexperienced. Very few aboriginals were seen with droving plants. With the average mobs of stores seen, there were the drover, horse tailer, cook, and four droving hands.

STOCK ROUTES.

The following is a brief summary of the main stock routes in the Georgina-Diamantina country, and stock route junction numbers are given (reference Queensland Stock Route Map, Sheets 4 and 2) :—

(i.) Georgina Stock Route.

Cattle cross into Queensland at Lake Nash (6), thence by stock route junctions 1630; 5 (Headingly); 4 (Urandangie); 939 (Carandotta); 3:30 (Herbert Downs); 31 (Marion Downs); 1353 (Marion Downs South); 33 (Breadalbane); 35 (Bedourie); 1 (Glengyle); 42 (Birdsville). As far as junction 30 (Herbert Downs) carries the main store traffic from the Territory. The complete route carries stores for the Georgina. On this route, approximately 469 miles long, there are only five Government watering facilities. Beyond these, travelling stock are dependent upon surface water in creeks, channels, waterholes, &c., that are on the stock route.

(ii.) Georgina-Wills-Burke Route.

Commencing at Lake Nash (6) via stock route junctions defined in the Georgina route as far as 4 (Urandangie), thence diverting through 25 (Ardmore); 1560:949:26 (Dajarra); 13:950; then down the Wills

and the Burke into Boulia, through junctions 1562 (Buckingham Downs); 28:29 (Boulia), rejoining the main route at 31 (Marion Downs).

This is a much-used alternative route to the Georgina route, putting an additional 70 miles on to the trip, but availed of when feed and water on the Georgina route is unsatisfactory. This diversion of approximately 200 miles carries three Government watering facilities.

(iii.) Georgina-Boulia-Winton Route.

This route carries a heavy traffic of stores, most of which eventually find their way into central and southern Queensland and to New South Wales. From Lake Nash (6) it comes into Boulia (29) by either of the routes already described, thence follows the main Boulia-Winton road through junctions 50 (Warenda); 51 (Hamilton); 1575:106 (Mackunda); 105:104 (Middleton); 149 (Collingwood); 148 to 210 (Winton).

The length of the route is approximately 465 miles and it is provided with twenty Government watering facilities. Of these, fifteen are on the Boulia-Winton stage of 240 miles, where surface water is scarce even in normal seasons.

(iv.) Georgina-Boulia-Diamantina Route.

This route carries heavy store traffic from the Territory and, commencing from Lake Nash (6), by either the main Georgina route or the Wills-Bourke route into Boulia (29), thence through stock route junctions 49 (Hamilton River); 1355:48 (Springvale); 109 (Diamantina Lakes); thence down the Diamantina through 110 (Davenport Downs); 45 (Monkira); 38 (Durrie); 40 to Birdsville (42), where it links with the main Georgina route. The length of the route is approximately 545 miles, provided with ten watering facilities, but there is none over the last 200 miles and dependence is entirely on Diamantina waters.

(v.) Georgina-Butru Route.

This route is used for fats droved to Butru for trucking to Townsville, and has been referred to under (ii.), defined by stock route junctions 1353 (Marion Downs South); 31 (Marion Downs) through Boulia (29), up the Burke to 28, thence up the Wills to 1562 (Buckingham Downs), through 950 to 27 (Butru). The total distance is 175 miles, and there are no Government watering facilities. Water is usually available along the Wills.

(vi.) Georgina-Boulia-Winton Route.

Used for movement of fats for trucking at Winton when Butru route impassable. Defined by junction numbers 1353 (Marion Downs South); 31 (Marion Downs) through Boulia (29), thence to Winton (210) as described under (iii.). Total distance is 286 miles and there are fifteen watering facilities, all on the Boulia-Winton stage.

(vii.) Diamantina-Winton Route.

The priority route for fats out from the upper reaches of the Diamantina and "between rivers." Defined by junction numbers 110 (Davenport Downs); 109 (Diamantina Lakes) to the Mayne Junction (108), where the route from Coorabulka and Springvale joins it, thence up the Diamantina through 107 (Cork); 148 (Collingwood) and in to Winton (210). The total distance is approximately 200 miles and there are four watering facilities.

(viii.) Diamantina-Quilpie.

This route, fed also by (ix.) and (x.) is the main route out for fats going to Quilpie for trucking to Wallangarra, Tenterfield, or Cannon Hill. It also carries a heavy traffic of stores from the Territory or the Georgina-Diamantina country and north-western Queensland destined for fattening properties on the Cooper and in New South Wales. The route from the territory to the Diamantina to junction 109 (Diamantina Lakes) has been referred to under (iv.). From 109 the route is defined by 110 (Davenport Downs); 1362: 111 (Palparara); 112 (Currawilla); 964 (Morney); 113 (Canterbury); 142 (Whitula); 41 (Windorah); 1782 (Hammond Downs), through 138: 137 down Kyabra Creek through Tenham (225), 227: 997 to 230 (Kyabra), thence through 232 (Eromanga); 231 (Borgie) to Quilpie (255), a total distance of 386 miles from the Diamantina, or approximately 740 miles from Lake Nash, with thirteen watering facilities from the Diamantina, a total of 23 from Lake Nash.

Stores may divert from this main route at the J.C. (113) and travel down the Cooper to fattening properties there or may go on to cross into New South Wales at Hawker (Warry Warry) gate or at Wompah Gate (approximately 900 miles from Lake Nash). They may also travel to New South Wales from Quilpie, going down the Bulloo to cross at Hungerford.

(ix.) Diamantina-Quilpie, via Monkira.

Fats and stores often go through Monkira (45) instead of along the main route through Palparara (111), traversing junctions 110 (Davenport Downs); 45 (Monkira); 1358 (Mooraberrie); 112 (Currawilla); 964 (Morney), thence to Quilpie as described in (viii.). The total mileage is much the same and there are no watering facilities between Monkira (45) and Currawilla (112), where it rejoins the main route.

(x.) Georgina-Quilpie Route.

This route carries fats to Quilpie and stores destined for the Cooper and New South Wales, defined by junctions 1 (Glengyle); 35 (Bedourie); 36 (Cluny); 45 (Monkira); 1358 (Moorcherrie); 112 (Currawilla); 964 (Morney), thence to Quilpie as under (viii.). The total distance is approximately 500 miles, with 11 watering facilities, only one of which is in the first 250 miles of the route.

(xi.) Other Routes.

In addition to the above routes, fats and stores destined for the Adelaide market or fattening properties in South Australia move out along the Georgina and Diamantina and cross at Birdsville for trucking at Maree. This would be a slightly shorter route than to Quilpie from the lower Georgina, but about the same distance for Diamantina cattle.

Fats and stores from Durrie may go to South Australia through Birdsville or to Quilpie, the Cooper, or New South Wales through Betoota, Currawilla, Windorah.

WATERING FACILITIES.

It will be realised from the above that the routes are poorly supplied with watering facilities, the only one that can be considered satisfactory being on the Boulia-Winton stage, where facilities average 1 every 20

miles (approximately). This guarantees an average of one drink every day where cattle travel at the rate of 10 miles per day. Cattle travelling at a slower rate can do very well on 20-mile water stages, even though they may not get a drink every day.

It is obvious that stock routes in this country could be improved by—

(*a*) Establishment of additional watering facilities on all the routes mentioned to give a reasonable assurance of water every 20 miles.

(*b*) Better equipment of existing facilities. In many cases, water supply in the troughing depends upon the functioning of a mill. It has been noted that it is not unusual for a mob of cattle to arrive at the facility only to find the troughs empty, either because the mill has broken down or because several windless days have followed the previous watering of a big mob of cattle. The establishment of pumping equipment to take the place of mills and the employment of rangers, whose duty it would be to patrol stock routes and make sure that all pumping equipment is in order, would be worth while.

However, it must be realised that a perfect system of water facilities on these routes would not, in itself, be sufficient to guarantee them against seasonal vagaries. Actually, it is the absence of feed on the routes, probably more so than the absence of water, that renders them impassable in certain seasons.

Very little can be done about the feed position, beyond the gazettal of additional alternative routes and the provision and equipment of watering facilities on those routes to enable spelling of main routes. In addition, though water may not be the main limiting factor in availability of stock routes, improvement of present facilities, and establishment of additional ones must improve the routes.

It would appear that mobs of 1,500–1,800 are rather hard on stock routes, and better management of routes would be possible if mobs were limited to 1,000 head.

SOCIAL CONDITIONS.

Generally speaking, this is a hard country in which to live, but apparently very healthy. The people who have spent many years in this back country are well developed, active, and mentally alert.

Housing Conditions.

With the advent of household refrigerators and electric light and power equipment of modern design, the every-day life at the station homestead has been rendered not only bearable but comfortable. The majority of the homesteads are of old design of pisé construction. It is unlikely that any more pisé dwellings will be built as it would appear that pisé artisans are an extinct race. The homesteads generally are comfortably furnished, gauzed to render them insect-proof, and every effort is made to make them as cool as possible in the devastating summers.

One homestead, built just before the war of timber construction, provides a cool, comfortable insect-proof dwelling equipped with all the modern labour-saving devices, and would be hard to beat anywhere in the pastoral areas.

Station buildings are generally constructed in timber, though recently on some properties angle iron frameworks are being used and are apparently quite satisfactory.

All stations maintain a most comprehensive store for their own requirements.

Living Conditions.

The life of the manager's wife is bearable when domestic help can be obtained, but it is not unusual for her to have to do all the station cooking without any assistance whatever, maybe for months at a time.

Food supplies have to be freighted in over long distances, but augmented by station-grown vegetables (grasshoppers permitting) and based on the luscious, unrivalled beef "fattened on the channels," there is little likelihood and no evidence of any nutritional diseases of the permanent population. In good seasons, station milkers provide the milk ration, but most properties maintain a herd of milch goats.

Children are educated with the assistance of the correspondence course to a certain stage and then go away for the completion of their schooling to centres such as Charters Towers, Brisbane, and Toowoomba.

It is worthy of note that the total white population of the area, excluding Boulia but including Bedourie and Birdsville, would be less than 200 souls. The aboriginal population would be less.

Communications.

Mails on the Georgina are distributed from Boulia and on the Diamantina from Winton by mail contractors who also carry freight consigned to the holdings. On the Georgina, the mail service is a fortnightly one, while the Diamantina is more fortunate with a weekly service. In times of flood, it is quite common to be without mails or freight deliveries for 6-8 weeks.

There is no telephonic communication, but all stations are equipped with pedal wireless sets. Actually, only one pedal-operated set remains, all other sets being operated from the electric power plant. Each station has its own call sign and regular "sessions" are held each day, giving everybody a chance to have a social chat with their "neighbours" and discuss the events of the day, great and small. These "chatty" sessions do much to alleviate the lot of the womenfolk, and are also thoroughly enjoyed by the menfolk (when at home).

This system of wireless inter-communication has given a degree of safety to this country which it never enjoyed prior to the introduction of the pedal wireless. There are many instances in the past of persons becoming lost and perishing in this country from thirst, starvation, or drowning. Nowadays, this is most unlikely to happen, as all properties are kept well informed by each other of details of the movement of any travellers. Pedal wireless also provides a medium for the despatch of telegrams, which always go on urgent priority conditions.

Medical Services.

Concurrently with the pedal wireless services has been the establishment and development of the Flying Doctor service, operating from Cloncurry. All stations are equipped with a complete "flying doctor" kit, containing drugs, instruments, and dressings for emergency cases, together with complete instructions for their use.

Should a person become sick or injured, the flying doctor can be contacted by wireless and history and symptoms of the case described, enabling the doctor, in many cases, to prescribe treatment with satisfactory results. When necessary, the flying doctor will fly to the property (all are equipped with landing fields) to conduct examination and carry out treatment, or to arrange for a patient's removal by aerial ambulance to hospital.

This outback country owes a tremendous debt (and realises it) to the Rev. John Flynn, and the establishment of the pedal wireless and flying doctor service constitutes a lasting memorial to his untiring efforts on behalf of these people.

POSSIBILITIES OF DEVELOPMENT.

Water Conservation and Controlled Irrigation.

It is probably only natural that, in a land which is unique because of its natural irrigation systems, most discussions for improvements of the area are centred around the improvement and controlled use of this natural irrigation system. Suggested schemes differ in detail, but the principle of them all is to block the waters of the main channels of the Diamantina and Georgina by weir construction so that the channel de-tributaries, channel swamps, and flood plains could be submerged at regular intervals in place of the present haphazard seasonal flooding.

It must be remembered, however, that the waters of the Diamantina and Georgina do not flow eventually to the sea, but actually disperse over the country in the vicinity of Lake Eyre. Moreover, the channel system is so wide that weirs would have to be miles in extent to block effectively the waters of the rivers.

If it were possible to control the waters and flood at will, then it is likely that no greater area of country would be flooded than is already achieved. It would simply mean that the flood incidence could be made an annual occurrence, instead of haphazard. Even so, it is not certain that annual flooding would be an improvement on the natural balance now maintained by nature. It is believed by many cattle men that when two or more good flood years follow in succession the feed from the second and subsequent floods is not of such high quality as that produced by the first flood, or, in popular parlance, is a "little sour." Cattle fail to fatten as quickly or as "firmly" on this "sour" pasture as they do on the feed following a flood after a period of no flooding.

This state of equilibrium between flood incidence and period of idleness or natural fallow that is typical of the channel country may have much to do with its extreme fertility. Perhaps if the dry periods of "natural fallow," during which great cracks open up the surface, did not occur, then soil fertility would deteriorate. For this reason, it is believed that it would be possible to "push" this channel country too far if regular annual flooding were attempted. If anything in this direction were attempted, it might be preferable to aim at biennial floods.

This is mainly conjecture, rather than the result of scientific findings following fertility investigations. Actually, the opinion has been expressed by at least one scientific investigator that it is unlikely that loss of soil fertility would occur in the event of annual flooding.

Regional Killing Works.

There is some weight of opinion in favour of the establishment of local killing works that would enable cattle to be slaughtered on the holdings and the carcases air-freighted to the capital cities for the local trade. This would certainly overcome the problem of long treks to meatworks, but the relatively low value of the freight in proportion to the high rate of freight charges would make the proposition uneconomic. Moreover, the losses incurred through the inability to process the many by-products at such killing works would be very considerable.

Road Transport for Fats.

At least one company with large interests in the area has given consideration to the practicability of using motor trailer transport to convey fats to railhead. If successful, this would undoubtedly overcome two of the greatest handicaps under which fattening is conducted, namely, distances from railhead and dependence upon favourable stock route conditions.

It would appear, however, that the rough roads would have to be replaced by better surfaces to make the venture a success, otherwise losses by bruising would offset most of the advantage gained. The capital outlay, of course, would be enormous as it would be necessary to run sufficient units to move a trainload at a time.

Nevertheless, this venture would appear to have better prospects of success than the establishment of regional works with air freight for carcases to capital cities.

Development by Railroad Construction.

It is fairly obvious that transport is the big problem of this outback country, and the railways are still unsurpassed for the haulage of big loads of livestock over distances of hundreds of miles. It is to railroad construction, therefore, that we must look for greater utilisation of these cattle areas.

There are two main problems—(*a*) the provision of railways to enable stores to be brought in quickly for fattening when the maximum feed is available, and (*b*) the provision of railways for haulage of fats to meatworks.

There is no doubt that the provision of railways for both purposes would be of inestimable benefit to the entire cattle country of western, north-western, and south-western Queensland, and particularly to the country of the Georgina and Diamantina, Cooper and Bulloo.

Under average seasonal conditions in the Georgina and Diamantina country, stores are brought in for fattening following a seasonal flood. The following year may be a bad one and it may not be possible to move off any cattle, either stores or fats, owing to the state of the stock routes. Should another bad year follow, as it sometimes does, the property is caught with an excess of cattle in drought or near-drought conditions and losses may, and do, reach extreme proportions.

With the provision of suitable railroad extensions, these conditions could not arise, as it would always be possible to move cattle, there would be no fats carried over to the next season, and the stores and breeders could be moved out for sale to reduce stocking.

The lush pasture conditions following flooding are not of long duration, and only after "record" floods will they last till the next season. To obtain maximum return, it is claimed that if stores could be brought in by rail and go straight on to the rich fattening pastures, the majority could be turned off the same season. That is, they would come in about April and be turned off as fats in, say, August-September. This is in contrast to the present conditions where stores come in, say, April, 1947, and are turned off as fats in July-August, 1949.

Perhaps this could be done if stores came in at 2½–3 years old instead of 18 months–2 years as at present, but even so, it is probable that only the tops could be turned off in the same season. Many would still have to carry over to the following season, which may not be a good one.

It must be admitted that the possibility of bringing stores in to lush pastures and turning them off as fats in the same season is open to conjecture, and certainly it would require a revision of the present breeding practices on the holdings from which the stores originate. However, there is no doubt that adequate railroad extension to guarantee movement of cattle out, as desired, would render cattle-raising in this country a much more stable venture and allow a slight increase in stocking without the fear of calamitous losses.

Another important feature of railway movement out is the fact that it would make possible the marketing of the baby beef that is really the "cream" of all this area, and which is now never marketed owing to the inability of this class of beast to walk the hundreds of miles to railhead without deterioration to little better than store condition.

It is believed that provision for railway movement outwards would enable stocking to be increased safely, and get fats to market so much earlier that the productivity of this vast area of country could almost be doubled.

Several routes have been suggested during recent years for railroad construction in this area, to provide for the movement of store cattle in and fats out, also to make possible the movement of cattle to relieve stocking when drought conditions are prevailing or are threatening. It is not within the scope of this report to discuss the economics of any of the suggested routes, but there is no doubt that the provision of adequate rail transport would mean more to the cattle industry in this far-western cattle country than any other project.

The most important routes that have been suggested in a recent report of the Bureau of Investigation are:—

(1) Standard gauge line from Camooweal to Dajarra, through Boulia, Monkira, Windorah, to Quilpie, Cunnamulla, and terminating at Bourke.

(2) The same as No. 1, except that the route would go direct from Boulia to Diamantina Lakes to Windorah, thence to Quilpie, Cunnamulla, and Bourke.

(3) The same as No. 1, except that the route would go from Monkira to Jundah, thence to Quilpie, Cunnamulla, and Bourke.

(4) The same as No. 2, except that the route would go from Diamantina Lakes to Jundah, thence to Quilpie, Cunnamulla, and Bourke.

Of the suggested routes, it would appear that No. 1 would be of most benefit to the cattle country, followed by 2, 3, and 4 in that order.

With the main strategic line of standard gauge, extensions of State gauge would link up from Windorah to Yaraka, from Durham Downs to Quilpie, and from Boulia to Winton.

Even if the main strategic defence line of standard gauge were not constructed, a great service would be rendered if it were possible to extend the present Queensland systems further into the area. For instance, if the line could be extended from Yaraka to Windorah to Monkira, or alternatively, from Quilpie to Windorah to Monkira, the cattle properties of the Cooper, Diamantina and Georgina would be within reasonable distance of railhead. Fats could be moved out (including baby beef) despite the condition of stock routes, and similarly relief movements would be possible.

It is extremely difficult to calculate or even to guess what additional fats could be marketed if such facilities were available; but, taking into consideration the fact that 2-year-old beasts could be marketed as fats, and remembering that heavier stocking of properties would be safer, it is possible that an additional 50,000 fats per annum could be obtained from the Georgina, Diamantina, and Cooper Rivers.

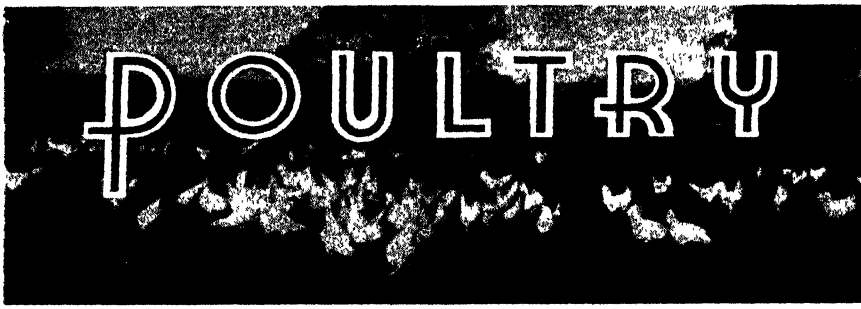
SUMMARY.

Summarising the possibilities of development of the Georgina and Diamantina cattle country, it would appear that the two main factors now restricting development are—(*a*) the lack of transport facilities, and (*b*) erratic seasonal conditions. Little can be done to stabilise seasonal conditions, beyond good management to alleviate the effects, but it is evident that, with adequate transport, the country would be capable of increased production, both in quantity and quality, and the industry in the area would be a much more stable undertaking than it is at present. Moreover, rail haulage is the most satisfactory and economical means of transport where large numbers of livestock have to be moved.

It must be realised, however, that there is a limit to the development that this country will stand, and it is essentially an area where cattle-raising is to be practised on large runs which are of light carrying capacity and which may owe their unique quality to a natural equilibrium of drought and flood, of fallow and plenty, and some cattle men believe that any vital disturbance of this natural equilibrium may result in a marked deterioration of that soil fertility and pasture cover that can, and do, produce such fine beef carcases as those "fattened on the channels."

ACKNOWLEDGMENTS.

It is desired to acknowledge with sincere thanks the hospitality and unbounded co-operation that was extended to us by all the fine people we met during the course of this investigation through the cattle country of the Georgina and Diamantina.



Poultry and Egg Production

P. RUMBALL, Officer in Charge, Poultry Branch*.

VISITORS to the Royal Show this year who are interested in the poultry section are again able to feast their eyes upon the best birds in the State. The exhibits reflect the care and attention that has been bestowed upon them. That this care and attention has been directed in the first place to keeping the birds fit and healthy is evidenced by their general healthy appearance, and the most casual inspection reveals the fact that every possible effort has been made to preserve the natural beauty of plumage, breed characteristics and outward appearance.

Shows serve a very useful purpose; among other things, they enable breeders to meet and compare notes. To select the best from your own yards is an easy matter, but it is not until they are benched with the best from other yards that many weaknesses in one's own birds are evident. Shows demonstrate very definitely that it is only the fit and healthy bird that has a chance to win, that a bird has to be true to type, and that with two birds of equal merit with respect to health and type the Judge's award will go to the bird that is the most attractive in appearance due to the preservation of its plumage.

The poultry industry of the State is not only concerned with showing. It is an industry that produces millions of dozens of eggs and millions of pounds of poultry flesh. These have to go before the judge, who in this instance is the consumer, whether he be in Australia or in Great Britain.

The producer of these commodities could well take a lesson from the show exhibitor. He has to see that his eggs are fit and healthy; in other words, fresh and wholesome. It is necessary to have eggs true to type; that is, eggs of reasonable size. They must also be in good plume; that is clean of shell and attractive in appearance. The same rules apply to poultry meat. This must be healthy; carcasses well fleshed and attractive in appearance.

It is estimated that during the past twelve months over 8,000,000 pounds of poultry meat were produced in Queensland, of which a little more than 1,250,000 pounds were exported to Great Britain, and during the same period the egg production was 14,000,000 dozen, the export of which exceeded 2,000,000 dozen.

Eggs are the most widely distributed commodity produced by poultry, and therefore naturally command our first consideration:

They must be fresh and wholesome;
They must be clean of shell and attractive; and
They should be of a good average size.

*In an Australian Broadcasting Commission talk from the Royal National Show.

Now at this stage little can be done in regard to the size of eggs being produced by existing flocks, but, as replacement of flocks is now taking place, attention should be directed towards future production by only using eggs for hatching purposes of a minimum weight of 2 ounces.

Production of Clean Eggs.

A hen normally lays a clean egg. It can be soiled by her feet, by dirty nest boxes and by broken eggs. The remedy is to give a bird an opportunity to clean her feet, to keep the nest-boxes clean, and to reduce breakages in the nest.

A fowl wanting to lay does not rush into the fowl-house and hop into the first vacant nest. She meanders up and down in front of the nests before making her selection and it is this habit that we should make use of to bring about a cleansing of the hen's feet. This is easily achieved if the area in front of the nests is kept covered with good dry clean litter, such as coarse pine sawdust, pine chips, broken straw or chaff. The use of the same class of material in the nests ensures clean nests provided it is renewed from time to time.

Fowls have a desire to crowd in nests. They frequently select one for this purpose which is well-filled with eggs, with the consequence that some eggs are broken and others soiled with egg material. Frequent gatherings will prevent many breakages and it is recommended that two gatherings should be the minimum daily practice, and during the flush season of production, three.

Certain types of nests referred to as community nests have been used by many farmers with considerable success. This type of nest is large and dark and capable of accommodating several birds. The darkness appears to subdue the quarrelsome nature of the layer, and supplies that privacy that a hen appears to look for. With community nests careful supervision should be exercised during hot weather, otherwise losses of birds may result from over-heating. This type of nest is not the answer to the production of clean eggs under dirty conditions, but more clean eggs would be produced with community nests under favourable conditions than with any other nest. Listeners who are interested could obtain a sketch by applying to the Department of Agriculture and Stock.

The answer to the question of how to produce clean eggs can be summed up in a few words: clean dry houses, floors well littered, clean nests and frequent gatherings.

The internal quality of the egg is equally as important as its external appearance. Many eggs have the internal quality destroyed by the farmer washing eggs in his effort to present to the buyer an attractive commodity.

The shell of the egg gives the impression that the internal content is protected from contamination. This is not entirely the case. Shells are porous. Most farmers, particularly those operating incubators, have noticed that during the process of incubation the air-cell increases in size. This could only occur by the passage of vapour through the pores of the shell. Rot producing organisms can enter the egg through these same channels.

Nature supplied some protection to the egg as she provided for a coating of mucilage-like material as the final coating of the shell. This is commonly known as the bloom. Washing eggs removes the bloom

and opens wide the door for bacterial invasion. Many experiments have been conducted with the object of determining a method of washing that would not subject the egg to germ attack, but none of them has provided an effective measure, and, consequently, all efforts have to be directed to produce an egg for market that does not require washing.

The wastage due to the export of washed eggs has been so extensive that the British Ministry of Food has made it a condition of its contract that all eggs exported in shell must be unwashed.

Soiled eggs may not be exported. Consequently, when it is found necessary to wash some eggs, they should be marketed in separate boxes and marked "Washed Eggs."

Egg quality can also be adversely affected by heat. Heat causes a rapid breaking down of the thick albumen content of the shell. When an egg with thin albumen is broken for frying or poaching, both it and the yolk spread. With a good fresh egg the yolk should stand well up with the albumen supporting it. If males are running with the layers, there is every possibility of the egg being fertile. Heat will bring about some germ development. Germ development is possible with a temperature in excess of 68 degrees Fahrenheit. In order to protect the loss of quality due to heat, egg producers are recommended to:

(i.) Place the nests in the coolest portion of the fowl-house;

(ii.) Gather the eggs frequently;

(iii.) Gather eggs in a wire basket. They will cool more rapidly in wire baskets than in buckets;

(iv.) Place baskets of eggs in a cool position;

(v.) Do not pack until cooled;

(vi.) Store eggs when packed in a cool position pending despatch to the market.

The use of large water-cooled safes is suggested as a means of keeping eggs cool. They have played their part upon many farms and in many countries.

Table Poultry.

The export of table poultry from Queensland is only in its infancy, but the quantity exported during the past twelve months was equivalent to about 400,000 birds. While Great Britain is meat hungry a ready market will exist for all exports of reasonable quality. In pre-war days, table poultry of the choicest quality poured into Great Britain from many countries. If Australia is to hold her markets in Great Britain for all time it is reasonable to assume that poultry meats from Australia will some day have to compete with poultry meats from other countries. There appears to be an opening for the development of a dual purpose breed that has a less objectionable leg colour than that of our Australorps, and one in which the pin feathers are not so prominent as in a black bird. It may be that the Leghorn-Australorp cross will be the answer to the trade. Cross breeding plays a prominent part in the poultry industry in America, both in egg production and for table poultry. Some breeders in the State enthuse over the Leghorn-Australorp cross, but as yet sufficient evidence is not available to suggest it as an answer to the production of both eggs and poultry meat.

MARKETING

Production Trends—August.

Dry conditions were general throughout the main central and southern farming districts, rain being limited to light falls which occurred at intervals, chiefly in the south coastal region. The Darling Downs received little more than half in inch for the month, but there is a good stand of herbage and an abundance of green fodder crops. Moderate rains received in the northern coastal area early in the month included several falls of over two inches in the Tully-Babinda district. At Innisfail up to four inches were recorded, resulting in some dislocation of sugar cane harvesting, but at the same time providing favourable conditions for ratooning and for young plant cane.

The Darling Downs, Maranoa, and Warrego pastoral districts are in good condition. In the greater part of the Central District and in the northern areas of the Central Highlands, drought conditions prevail, the pastures in the Longreach-Winton area being particularly bad.

Although winter cereal crops are still making progress due to the previous heavy May-June rains, dry conditions have prevailed for approximately six weeks, and further good rains would be of great value to pastures and all growing crops. Provided adequate rains are received before the end of September the prospects of harvesting a record wheat crop are bright.

Land is being prepared for the sowing of summer grain and fodder crops In the northern tobacco districts, irrigated areas will be ready for planting during September. Rain is urgently needed so that final preparations for the planting of cotton may be completed.

Dairy production continued to be very satisfactory for this time of the year. Production of butter during July was the highest July production since 1942.

The Brisbane Wholesale Fruit and Vegetable Market.

Tomatoes continued in very light supply during August and realisations were maintained at very high levels. Choice local Salads were firm throughout the month at 31s. to 36s., and occasionally more, per half-bushel case.

With slightly increased quantities of peas and beans being received, top values declined gradually from 1s. 3d. and 1s. 6d. per lb. on opening to 9d. and 10d. per lb. respectively at the close of the month.

Returns for root vegetables represented excellent values to growers, with carrots reaching as high as 65s. and parsnips 47s. per cwt.

Citrus fruits were plentiful. Choice packs realised good prices but other grades were slow of sale at moderate figures.

The strawberry season was at its peak. Fruit generally was good and prevailing demand allowed clearances to be made at prices satisfactory to growers.

The Tobacco Leaf Marketing Board.

The inaugural meeting of the Tobacco Leaf Marketing Board was held on 13th August in the offices of the Department of Agriculture and Stock. Mr. G. H. Short of Dimbulah was appointed Chairman for the initial term of three years, and Mr. T. V. Gilmore was elected as the Board's representative on the Council of Agriculture. The Board proposes to set up its office in Mareeba, and has appointed Mr. J. L. Power of South Brisbane to act as liaison officer between the Board and southern Queensland growers. The Board will again meet early in September to discuss marketing policy and other matters.

Co-operative Milk Production in Sweden.

Sweden has recently applied the principle of co-operation to milk production. In 1944 a group of farmers formed an organisation to operate a co-operative dairy barn. The barn is jointly owned by 11 farmers who individually own and operate a combined tract of about 125 acres of arable land and 1,500 acres of other land.

This information comes from the May issue of "*Foreign Agriculture*," which points out that the advantages of the co-operative operation of the dairy barn include (1) saving in capital investments in buildings and equipment; (2) increased efficiency in milk production, especially in regard to utilisation of labour; (3) reduction of the work load of the farm woman, who is given more time for the home and for such operations as poultry raising.

Total cost of construction amounted to 50,000 dollars, 17 per cent. of which was contributed by the Swedish Government which is encouraging such projects to serve as test cases, and 28 per cent. by the consumers' co-operatives as grants or gifts. The remainder was financed by a State loan, secured by mortgage, and by member contributions amounting to 15 per cent.

CURRENT FEEDING VALUES FOR MONTH OF AUGUST, 1948.

(Division of Animal Industry and Division of Marketing).

Feed.	Starch Equivalent Value per 100 lb.	Protein Value per 100 lb.	Average Wholesale Selling Price at Brisbane.	Cost per Starch Equivalent Unit.	Remarks.
			STARCH CONCENTRATES.		
Wheat	72	8	7s. 7d. bushel	2·11	Wheat fairly
Wheat meal ..	72	8	£14 13s. 4d. ton	2·44	plentiful;
Maize	78	8	7s. 9½d. bushel	2·14	other grains
Maize meal ..	71	8	£16 10s. short ton	2·78	light.
Sorghum.. ..	71	7	£13 10s. ton	2·03	
Sorghum meal ..	71	7	£13 10s. short ton	2·28	
Barley	71	7	Not quoted		Imported bran
Barley meal ..	71	7			and pollard
Oats	62	8	5s. 9d. bushel	2·78	available.
Crushed oats ..	62	8	5s. 11d. bushel	2·87	
Pollard	66	10	£12 10s. short ton	2·27	
Bran	56	10		2·69	
Molasses ..	50	1	47s. 6d. 44-gal. drum	2·59	
			PROTEIN CONCENTRATES.		
Meat meal ..	80	55	Not available		
Linseed meal ..	72	25			
Peanut meal ..	78	43			
Blood meal ..	63	68			
Cottonseed meal	67	33			
			ROUGHAGES.		
Lucerne hay and chaff	40	10	Hay £8 ton	2·14	Wheaten chaff scarce and of
Oaten hay ..	33	3	Chaff £11 ton	3·01	varying
Wheaten hay ..	33	3	Not available		quality.
Oaten chaff ..	40	3	£11 5s. ton	3·01	Values
Wheaten chaff ..	40	3	..	..	erratic.

MINERAL SUPPLEMENTS.

Ground calcium carbonate (limestone)	Not quoted
Bone meal	£11 ton
Bone flour	Not quoted
Shell grit (dicalcic phosphate) ..	4s. bag

The Royal National Show.

Plate 53.

WHEAT IMPROVEMENT.—This display by the Agriculture Branch was designed as a tribute to Mr. R. E. Soutter, breeder of wheats which make up most of the Queensland crop.

Plate 54.

SOIL CONSERVATION.—Proper and improper methods of land utilisation were strikingly displayed by the Soil Conservation Section.

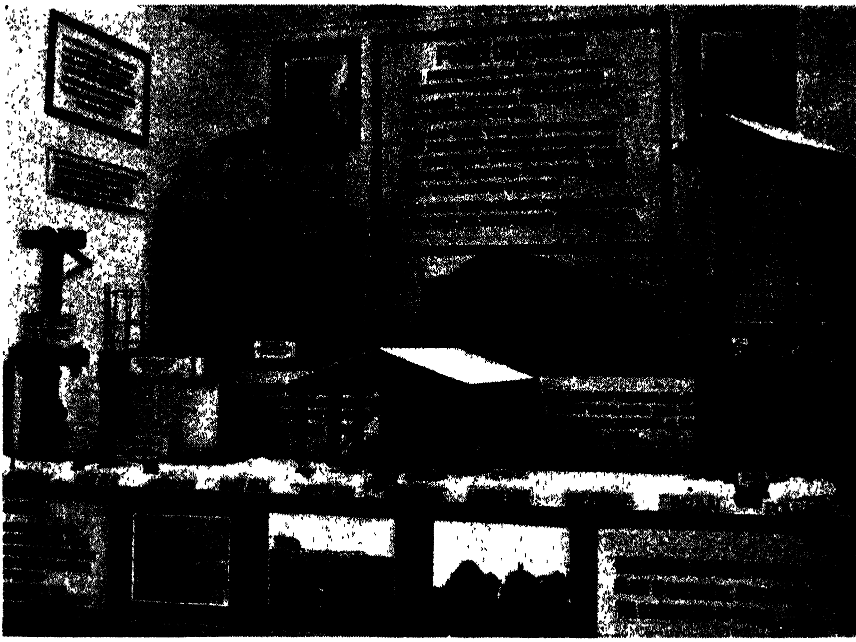


Plate 55.

FODDER CONSERVATION.—This exhibit served as a reminder of the facilities provided by the Department for landholders undertaking construction of silos.

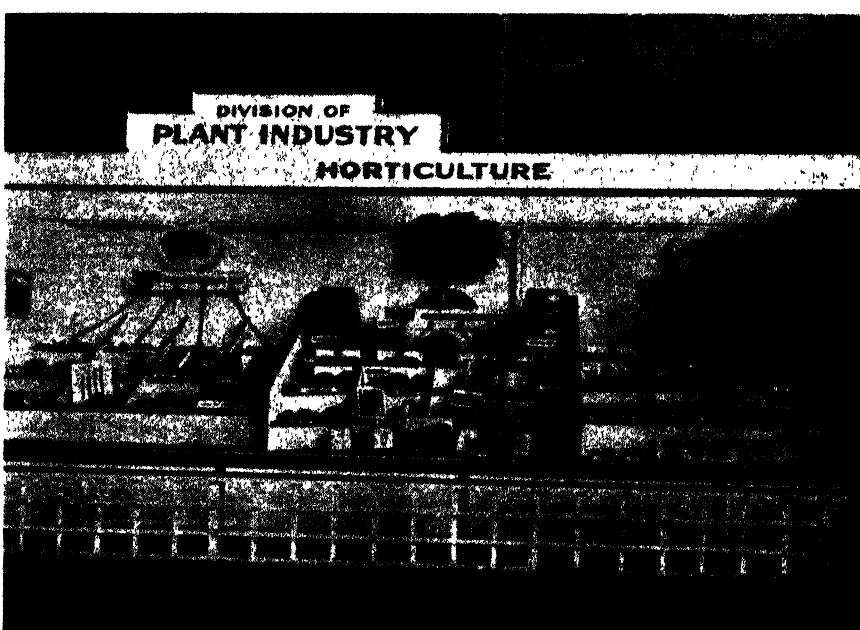


Plate 56.

HORTICULTURAL PRODUCTS.—The essentials in producing quality tomatoes, papaws, and avocadoes were represented by the Horticulture Branch display.

Plate 57.

PLANT PROTECTION.—The revolution in insecticides was the theme of the Entomology Section's display. The Plant Pathology exhibit demonstrated the several methods of combating plant diseases. Weeds, poisonous plants and native fodders made up the display of the Botany Section.

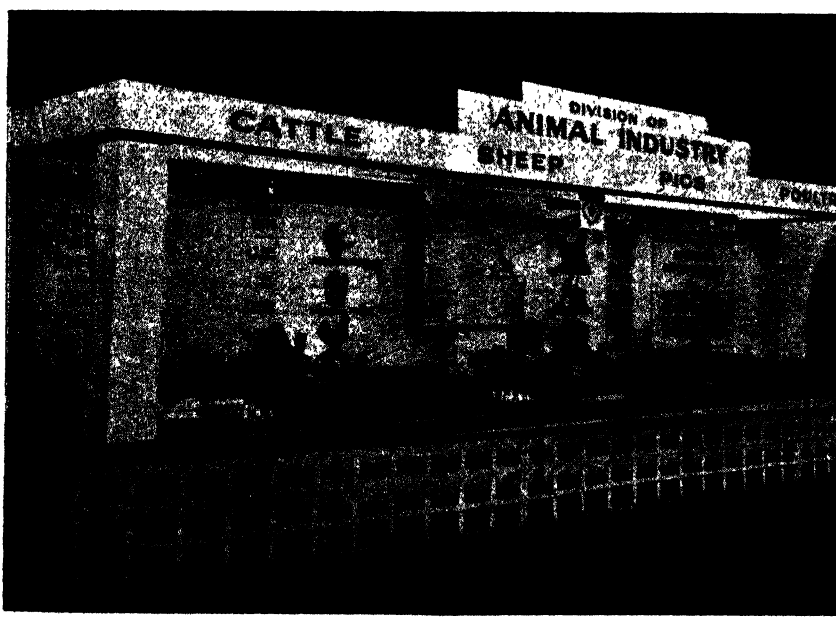


Plate 58.

LIVESTOCK PRODUCTS.—In a comprehensive display, the Division of Animal Industry pinpointed the various ways in which production of livestock products

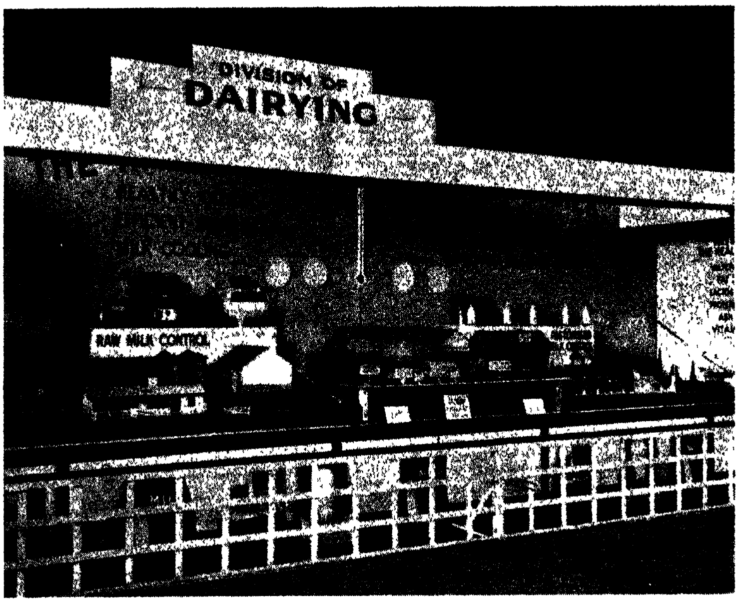


Plate 59.

CLEAN MILK.—The Division of Dairying illustrated the steps taken from farm to delivery to ensure a clean, healthy milk supply.

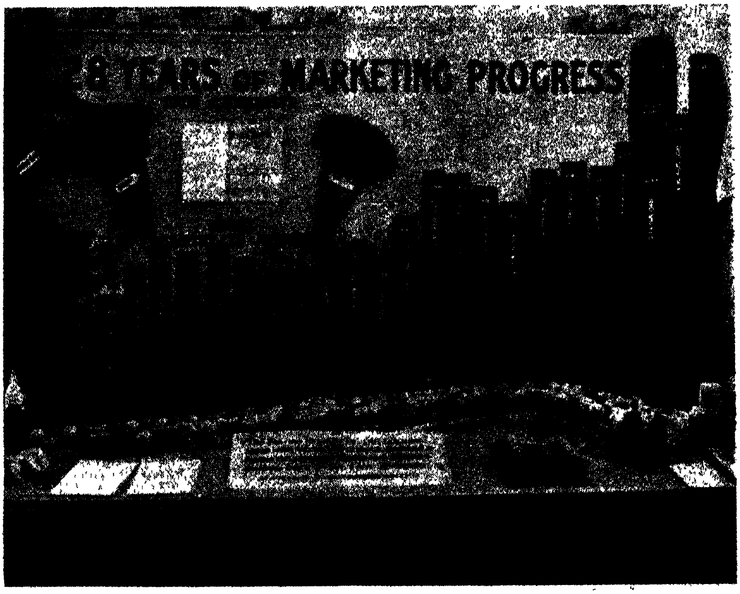


Plate 60

MARKETING PRIMARY PRODUCTS.—The progress of producer-controlled marketing through commodity Boards was graphically shown by the Division of Marketing. The crop forecasting service was also explained.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

CARE OF THE NURSING MOTHER.

The importance of breast feeding to the baby cannot be over-emphasised.

Now that the summer is approaching with its risks to the artificially fed baby of diarrhoeas caused by either food or infection we must make every effort to ensure that babies who have their own mothers shall be fed on their own mothers' milk. Statistics taken in every country show that the death and sickness rates in breast-fed babies are much lower than for those who are bottle-fed.

The first and most important step towards successful breast feeding should really be taken long before baby is born, and that is the mother's decision that she is going to feed her baby. If she is convinced, as she should be, that this is best for both the baby and herself she will do whatever makes it possible for her to have enough milk.

Most of the rules for successful breast feeding are simple and easily followed. these are—

1. *Fresh Air.*

For a healthy blood supply fresh air is essential. In a Queensland summer there is usually no lack of this in the daytime, but some people do not have enough fresh air at night. Thorough ventilation—that is, a moving current of fresh air—is essential both day and night.

2. *Water.*

Extra water during the nursing period is very necessary. Baby is taking between one-and-a-half to two pints of fluid daily from the mother, and it follows that extra fluid to this amount is required by her. Milk, fresh fruit drinks, and plain cool water will supply necessary fluids and the mother should take a glass of water each time before babe commences his feed.

3. *Clothing.*

Clothing should be light and loose and hang from the shoulders. Tight garments should not be worn.

4. *Cleanliness.*

Personal cleanliness is essential; the daily bath is necessary for the health of the skin.

Dental hygiene is most important. The mother who has decaying teeth or inflamed or suppurating gums will absorb poisons from them into her bloodstream, and her own health and that of the child will suffer as a result.

5. *Exercise.*

Daily exercise in the open air is a necessity. A plea is frequently made that domestic duties give enough exercise, but it must be remembered that open air and sunshine act as a tonic for both mind and body. As a daily walk outdoors is necessary for baby also it should be made a regular routine.

6. *Bowels.*

Every effort should be made to regulate these with the right food, exercise, and regular habits. Aperients should not be necessary.

7. *Diet.*

The diet of the nursing mother is *most important* both to herself and baby. In these days of high prices it is usually mother who goes without milk or fruit or meat so that father or the rest of the family may have a good share. This should not be, and husbands should learn what foods are necessary for mother to protect her own and baby's health and see that she has them. Advice or a book with instructions re diet may be obtained from the Sister at your local Welfare Centre.

8. *Rest.*

A nursing mother needs at least 8 hours sleep every night and an hour's rest in the daytime with her feet up. A very busy mother may find this difficult, and here again her husband and family must help her. A high stool should be provided in the kitchen on which she can sit to do many tasks such as preparing vegetables, ironing baby's clothes, and so on. Sewing or darning can be done just as easily in the open air, resting on a lounge or comfortable chair with the feet up.

9. *Worry and Excitement.*

Nursing mothers should try to avoid worry and emotional upsets, and here again must be assisted by their families.

10. *Smoking and Alcohol.*

Nursing mothers would be well advised to cease smoking. It has been demonstrated that after a mother has smoked seven cigarettes nicotine is present in the breast milk. This definitely affects both the quality of milk and the baby's progress. Alcohol also has no advantages and may be harmful.

Any further advice on this and other matters connected with children may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

Carrot Soup.

Ingredients: 1 lb. carrots, 1 large onion, 1 quart stock, 1 oz. flour or other thickening, little milk, nutmeg.

Scrape the carrots and shred on a grater. Peel and shred the onion. Put the vegetables with the stock and simmer until tender. Adjust seasoning to taste and thicken as required. Serve with a dash of grated nutmeg.

Scotch Broth.

Ingredients: 1½ to 2 lb. lean mutton, 2 leeks, 3 pints cold water, 1 teacup each finely-chopped carrots, onions, cabbage, celery and turnip, 1 teacup barley, 1 dessertspoon chopped parsley, seasoning, 1½ oz. bacon fat (if available), pork or mutton dripping.

Cut up the mutton into convenient pieces, put into a pan with the cold water and bring to boiling point. Skim and stir in barley, cover, and simmer for about 1½ hours. Meanwhile prepare the vegetables and fry in the melted fat for 5 to 6 minutes without colouring. Add these to the cooked meat and season to taste. Replace lid and continue simmering until the vegetables are tender. Stir in the chopped parsley last of all before serving.

QUEENSLAND WEATHER IN AUGUST.

During August there was no rain over the Tropical and Central interior districts and in the sub-tropical interior only very isolated light showers were received in parts of the Warrego and Maranoa. Apart from isolated showers on the Central Coast that district as well as the Central Highlands was also rainless as well as most of the Port Curtis subdivision. In the first part of the month showers in the far North Coast (Barron) gave over average results in the narrow coastal belt. To the north and south of Brisbane the restricted coastal fringe of the Moreton Division received 1 to 2 inch falls on the 28th, otherwise showers in that Division were mostly light. Some places on the East Downs received moderate showers 11/12th and 20/21st but other Downs stations reported from nil to light totals. The East Downs district aggregate of 66 points was 50 per cent. below normal and the West Downs 19 points was 78 per cent below Although parts of the North West, Central Highlands and Central Coast received moderately useful rains in July, most pastoral areas in the Central and Tropical Divisions of the State will welcome early spring storms. Most sub-tropical pastoral districts still maintain the benefits of favourable summer and autumn rains, but in the South-Eastern Districts the dry spell of the last two months is beginning to affect dairying pastures. A record wheat area of 550,000 acres is in general holding out well, as all subsoils were soaked by the heavy May and June rains and frost periods during July and August have checked any early tendency to rank growth.

Pressure.—During most of the month the predominating continental high pressure belt was the main control for Queensland. Central areas of these systems as they crossed New South Wales and South-East Queensland brought moderate south-easterly weather along the Queensland coast from the 4th to 14th. After the middle of the month activity in the southern low pressure became more pronounced and trough and cold south-west to southerly frontal circulation brought rough weather off the South Coast on the 19th and scattered showers in the south-east border districts 21/22nd. On the 23rd and 24th another vigorous cold front brought snow and sleet in southern States with the usual moderate to strong westerly to south-west wind circulation in southern Queensland, where strong westerlies again set in at the end of the month with another vigorous closed centre crossing Tasmania.

Temperatures.—Maximum temperatures were mostly about normal ranging from 1.3 degrees below at Cairns to 1.1 degrees above at Mitchell. Minimum temperatures were mostly slightly below normal from 0.2 degrees at Mitchell and Richmond to 2.4 degrees at Palmerville; Boulia and Longreach were 0.30 and 0.10 above. Frosts were fairly prevalent in the south-east quarter with cold periods in the tropical interior Stanthorpe reported 23 frosty nights.

Rain position is summarised below:—

Division.	Normal Mean.	Mean August, 1948.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	20	6	70 below
Peninsula South	7	1	86 „
Lower Carpentaria	10	0	100 „
Upper Carpentaria	25	0	100 „
North Coast, Barron	114	136	19 above
North Coast, Herbert	167	120	28 below
Central Coast, East	77	5	94 „
Central Coast, West	50	1	98 „
Central Highlands	84	0	100 „
Central Lowlands	48	0	100 „
Upper Western	16	0	100 „
Lower Western	32	0	100 „
South Coast, Port Curtis	118	14	88 „
South Coast, Moreton	169	133	21 „
Darling Downs, East	131	66	50 „
Darling Downs, West	88	19	78 „
Maranoa	91	1	99 „
Warrego	75	12	84 „
Far South-West	49	9	82 „

Commonwealth of Australia, Meteorological Bureau, Brisbane

ASTRONOMICAL DATA FOR QUEENSLAND.

NOVEMBER.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.59	6.5	Cairns	45	12	Longreach	42	28
6	4.55	6.9	Charleville	29	25	Quilpie	33	37
11	4.52	6.12	Cloncurry	61	38	Rockhampton ..	17	3
16	4.50	6.16	Cunnamulla ..	28	31	Roma	18	15
21	4.48	6.20	Dirranbandi .	17	21	Townsville.. ..	37	12
26	4.47	6.24	Emerald	26	13	Winton	49	31
30	4.46	6.27	Hughenden ..	46	24	Warwick	3	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	a.m.	p.m.
1	4.43	6.08
2	5.22	7.15
3	6.04	8.21
4	6.52	9.25
5	7.44	10.23
6	8.40	11.16
7	9.38	..
		a.m.
8	10.36	12.01
9	11.32	12.40
	p.m.	
10	12.26	1.14
11	1.19	1.45
12	2.11	2.13
13	3.03	2.41
14	3.57	3.08
15	4.53	3.38
16	5.51	4.10
17	6.52	4.46
18	7.55	5.28
19	8.58	6.17
20	9.57	7.14
21	10.51	8.16
22	11.38	9.23
23	..	10.29
	a.m.	
24	12.20	11.35
		p.m.
25	12.57	12.40
26	1.32	1.43
27	2.05	2.46
28	2.39	3.50
29	3.16	4.55
30	3.57	6.01

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS)

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	24	14	40	29	15	4	46	33
6	30	9	46	24	21	1	54	26
11	23	14	39	30	14	5	45	34
16	13	25	28	41	2	16	31	48
21	10	30	25	45	0	21	27	53
26	18	19	33	35	9	10	38	41
30	27	11	43	26	18	0	50	29

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS)

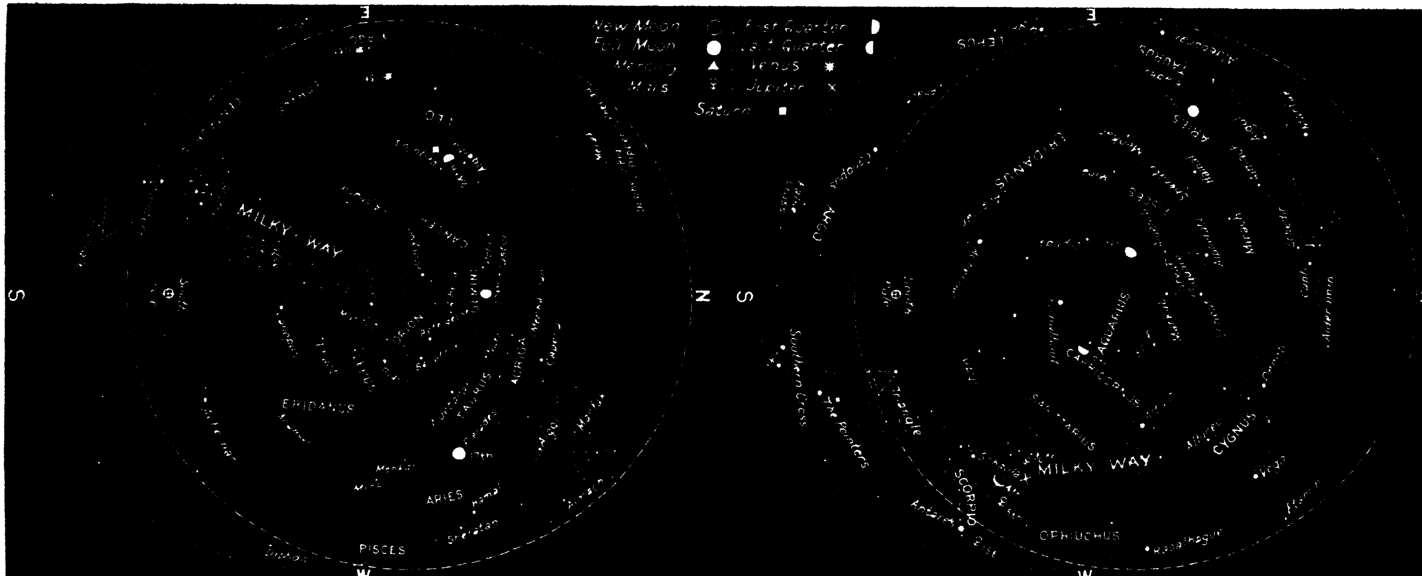
Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	40	15	57	41	42	26	33	14
3	51	5	65	34	49	20	42	6
5	56	2	68	32	52	17	46	3
7	54	5	67	34	51	20	44	6
9	46	9	62	36	47	22	38	9
11	38	18	56	43	41	27	32	17
13	27	28	49	49	33	34	23	24
15	18	38	42	57	27	42	16	33
17	8	48	36	62	21	48	8	40
19	2	55	33	67	17	52	3	45
21	5	55	35	67	19	52	5	45
23	9	47	37	62	21	47	8	39
25	20	36	43	55	28	40	17	31
27	27	24	49	46	33	31	23	21
29	43	12	59	38	44	24	36	12
30	47	7	63	35	47	21	39	8

Phases of the Moon.—New Moon, November 1st, 4.02 p.m.; First Quarter, November 9th, 2.46 a.m.; Full Moon, November 17th, 4.31 a.m.; Last Quarter, November 24th, 7.22 a.m.

On November 15th the Sun will rise and set 20 degrees south of true east and true west respectively and on the 13th and 28th the moon will rise and set approximately at true east and true west respectively.

Eclipse of the Sun.—On November 1st a total eclipse of the Sun will be visible from a path about 40 miles wide stretching from the centre of Africa, across the Indian Ocean just north of the island of Madagascar, and continuing to the south of Australia; terminating to the east of the South Island of New Zealand. For about 2,000 miles on either side of this path the eclipse will be seen as a partial one and from the southern portion of Queensland at the maximum phase the disc of the moon will extend a little less than half-way across the Sun. The amount of "darkening" of the Sun's disc decreases as we go north until at Cape York no eclipse is seen. The times of beginning &c. are not the same for all places as in an eclipse of the moon and at Brisbane the disc of the moon will meet the Sun to the left of the point nearest the horizon at 4.57 p.m. In the eastern part of the State the time of commencement will be later as we go north and may be as much as 15 minutes later than at Brisbane while in the south-western districts the time of commencement will be up to 10 minutes earlier than at Brisbane and merging to no difference in time with Brisbane in the north-western part of the State. The time of maximum phase at Brisbane is 5.49 p.m. and again the time of maximum phase at other places varies as stated above. East of a line joining Innisfail, Blackall and Cunnamulla, the Sun will have set before the eclipse ends but west of this line the moon will have completely passed over the Sun's disc before sunset.

Mercury.—A morning object all this month. On the 1st, in the constellation of Virgo, will rise 50 minutes before the Sun and on the 4th will reach greatest angle west of the Sun. On the 30th, in the constellation of Scorpio it will rise about 25 minutes before the Sun.



Venus.—Throughout this month will rise between 3 a.m. and 4 a.m. and will remain in the constellation of Virgo.

Mars.—At the beginning of the month, in the constellation of Orphiuchus, will set between 8.30 p.m. and 9.30 p.m and at the end of the month, in the constellation of Sagittarius will set between 8.20 p.m. and 9.20 p.m.

Jupiter.—In the constellation of Sagittarius will set between 9.45 p.m. and 11 p m. on the 1st and between 8 20 p.m. and 9.20 p.m. on the 30th when Mars and Jupiter will be about one degree apart, Jupiter being the brighter and more northerly planet.

Saturn.—In the constellation of Leo will rise near midnight during the month.

Star Charts.—The chart on the right is for 7 15 p m. in the south-east corner of Queensland to 8.15 p m. along the Northern Territory border on the 15th November. (For every degree of longitude we go west the time increases by 4 minutes) The chart on the left is for 8 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars, which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

AUGUST.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall. Aug.	Average Rainfall. No. of years' records.	Total Rainfall. Aug., 1947.	Total Rainfall. Aug., 1948.
	In.		In.	In.
North Coast.				
Atherton	0·84	42	4·99	0·66
Cairns	1·65	61	4·94	1·99
Cardwell	1·22	71	3·11	0·69
Cooktown	1·17	67	4·65	1·04
Herberton	0·61	57	3·71	1·04
Ingham	1·44	51	1·41	0·33
Innisfail	4·85	62	9·39	4·98
Mossman	1·34	19	5·28	0·91
Townsville	0.50	72	3·25	0·00
Central Coast.				
Ayr	0·58	56	0·93	0·00
Bowen	0·72	72	0·22	0·07
Charters Towers ..	0·50	61	1·12	0·02
Mackay	1·09	72	1.58	0·08
Proserpine	1·45	40	2·10	2·46
St. Lawrence ..	0·79	72	3·43	0·14
Central Highlands.				
Clermont	0·70	72	1·17	0·00
Springsure	0·99	74	2·29	0·00
South Coast.				
Biggenden	1·04	44	0·94	0·24
Bundaberg	1·27	60	1·47	0·07
Brisbane Bureau ..	1·90	91	0·50	1·35
South Coast—contd.				
Caboolture	1·62	67	0·72	2·14
Childers	1·21	48	2·11	0·26
Crohamhurst.. ..	2·17	50	1·11	0·00
Esk	1·39	56	0·58	0·78
Gatton College ..	1·08	44	0·64	0.00
Gayndah	1·12	72	0·88	0·22
Gympie	1·65	73	2·12	0·36
Kilkivan	1·35	62	1·58	0·14
Maryborough ..	1·61	72	1·30	0·66
Nambour	1·88	47	1·43	1·48
Nanango	1·29	61	1·27	0·38
Rockhampton ..	0·82	72	2·26	0·01
Woodford	1·61	55	0·61	0·83
Darling Downs.				
Dalby	1·16	73	0·66	0·07
Emu Vale	1·06	47	0·48	0·32
Jimbour	1·10	64	0·53	0·00
Miles	1·08	58	1·29	0·00
Stanthorpe	1·73	70	0·90	1·35
Toowoomba	1·58	71	1·43	0·61
Warwick	1·40	78	0·64	0·84
Maranoa.				
Roma	0·86	69	2·40	0·00
St. George	0·91	62	3·52	0·05

CLIMATOLOGICAL DATA FOR AUGUST.

(Compiled from Telegraphic Reports.)

Divisions and Stations	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature. Mean Max.	Shade Temperature. Mean Min.	Extremes of Shade Temperature. Max.	Extremes of Shade Temperature. Date.	Extremes of Shade Temperature. Min.	Extremes of Shade Temperature. Date.	Rainfall. Total.	Rainfall. Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Coastal.									
Cairns	..	78	60	81	21	50	29	199	6
Herberton	..	71	48	81	21	30	26	104	10
Townsville	..	78	57	84	23	47	22	Nil	..
Rockhampton	30·11	77	51	87	20	39	22	1	1
Brisbane	30·12	72	51	80	15	44	18	135	8
Darling Downs									
Dalby	..	71	42	80	31	30	17	7	1
Stanthorpe	..	63	36	72	31	25	17	135	8
Toowoomba	..	65	42	74	31	32	14, 18	61	6
Mid-Interior.									
Georgetown	..	84	54	88	31	37	26	Nil	..
Longreach	30·13	79	47	89	31	37	1	Nil	..
Mitchell	30·15	72	39	84	31	29	17	Nil	..
Western.									
Burketown	..	79	57	90	6, 7, 9	47	25	Nil	..
Boulia	30·06	79	49	89	30	40	17,21,24	Nil	..
Thargomindah	30·12	72	44	83	30	39	2, 5, 14, 16,17,18	18	2

A. S. RICHARDS,
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Commonwealth of Australia,
Meteorological Bureau, Brisbane.

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C. W. WINDERS, B.Sc.Agr.

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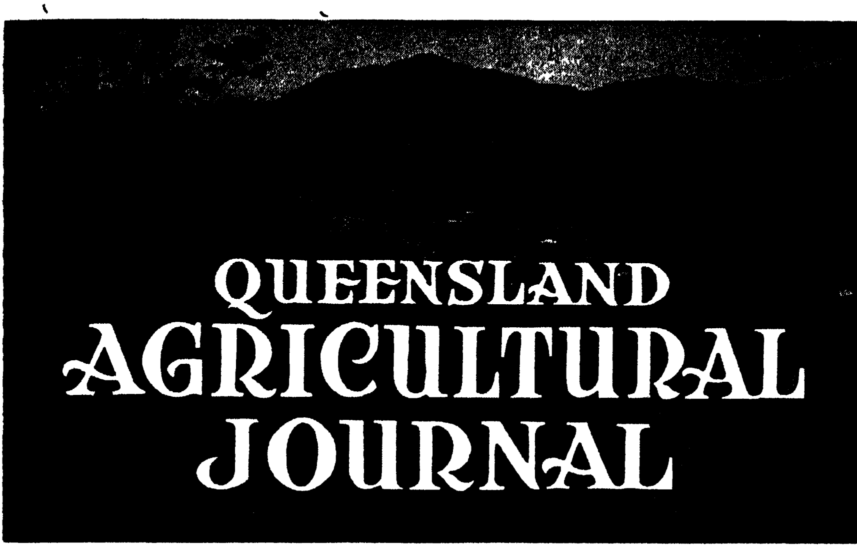
Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Art, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**



Volume 67 | 1 OCTOBER, 1948 | Part 4

Event and Comment.

Livestock Breeding.

NOTED American animal breeder, Professor Jay L. Lush, of Iowa State College, was warmly welcomed by scientific workers and practising livestock breeders when he visited Queensland in September. He came with a solid reputation as a geneticist and breeder and had some stimulating things to say to local stockraisers.

In a broadcast talk in the A.B.C. Country Hour session, Professor Lush outlined recent advances in genetics which the scientific worker is using as his tools in the improvement of livestock.

One of these advances is a better understanding of the "mathematics of inheritance." While the individual offspring gets half of its character-determining factors from each parent, the halves which it gets are only sample halves and within a group of offspring there may be wide variations. A knowledge of how these variations are brought about enables the breeder to sort out significant from insignificant facts and permits him to ignore with confidence occasional happenings that deviate far from the average. Progeny testing is now receiving increased attention from animal breeders following the elucidation of the sampling nature of inheritance.

The testing of a particular individual has in the past been based largely on that individual's performance. Plant breeders have for a long while been using the "sib" test—that is, the "sister-brother" test—for assessing the value of bred material. This test, as its name implies, consists in the evaluation of an individual's brothers and sisters as well as the individual itself. Obviously, the value of sib-testing is strictly limited in the case of the less prolific lines of livestock, but the test is now being applied in poultry and pig improvement.

The basis of line-breeding of livestock is now becoming better understood, and as the factors governing it are sorted out the method can be organised to yield the best possible results.

Professor Lush gave some interesting information regarding progress being made in the use of hybrid vigor in livestock breeding, and indicated that it is now being commercialised in the the same way as hybrid maize. The procedure is to develop inbred lines, test these lines and their crosses, select the best of the crosses, and finally multiply the chosen crosses for commercial distribution. In the case of chickens, which lend themselves more than any other type of domestic animal to improvement by hybridisation, several years are required to build up to the stage of commercial production.

Though he was able to spend only a few days in Queensland, Professor Lush managed to visit a few cattle and sheep studs and to discuss breeding plans with representatives of Government Departments and breed societies. His survey of Australia's requirements in technical services in livestock genetics and breeding should yield useful results.

Radio Listening Groups.

THROUGHOUT the year the Australian Broadcasting Commission runs a series of broadcasts for discussion by listening groups, which can take the form of members of a family, a group of friends or a club. The object of these programmes is to develop an informed public opinion on important questions of the day by discussion of broadcasts and supplementary material by members of the listening groups.

The A.B.C. provides listening groups with scripts of the broadcasts, questions for discussion, and supplementary literature. It invites groups to send in reports of their discussions together with questions. The reports are referred to an authority on the subject concerned and replies to questions are furnished. At the conclusion of each series, a bulletin of the more significant issues and queries raised by groups is mailed to all registered groups.

A series on "Heredity and Man," incorporating a broadcast on "The Application of Genetics to Domestic Animals," commences on 20th December. Subsequent series include "All Work and No Play? . . . .," "Fuel," and "What's Your Solution to the Growing Social Conflict?"

Readers interested in forming a listening group should write to The Organiser of Listening Groups, G.P.O. Box 487, Sydney.

Improvement of Citrus Trees.

UNDER its Citrus Budwood Scheme, the Department supervises the collection and distribution of all budwood of the major citrus varieties which have been classified as "A" grade varieties. The buds are taken, in the main by Departmental officers, from trees which are known to be true to type, free from disease and of good cropping capacity. Since its inception in 1934 the scheme has stimulated a steady improvement in the quality of the State's citrus plantings.

During the recent spring budding period, over 100,000 buds were collected and distributed to nurserymen. This is a record for a single season and is an indication of the keen demand for young citrus trees of good quality.

"Hormone" Weedkillers.

C. W. WINDERS, Officer in Charge, Information Services.*

ONE of the most promising of the modern developments in weed control is the use of what are known as growth-regulating substances, or hormones. These substances occur naturally in plants, where they serve to regulate certain of the plant's activities, just as secretions from the thyroid and other glands regulate certain functions of the animal body.

Effects on Plants.

When applied in more than minute amounts, hormones upset the normal rhythm of plant growth and development, causing effects ranging from slight distortion of leaves to death of the entire plant. The effect on a particular species varies with growing conditions and stage of growth, and possibly other factors are of importance also. Therefore, the results observed after spraying certain weeds with hormone weedkillers can be very variable and it may be a considerable time before the best conditions for killing such weeds have been determined.

An important point to bear in mind is that, once beyond the early seedling stage, grasses and cereals are seldom more than slightly damaged by hormone weedkillers. Hence, the hormones are useless against grown plants of Johnson grass, crowsfoot, summer grass, paspalum, couch grass and the like, though injury may be caused to flat-leaved grasses, such as broad-leaved carpet grass, under turf conditions.

The fact that members of the grass family possess a high degree of tolerance towards hormone weedkillers enables such weedkillers to be used in pastures, lawns, cereal crops, and sugar-cane for the control of susceptible broad-leaved weeds.

Method of Action.

In the case of susceptible annual weeds sprayed when young, a thorough application will upset the functioning of the leaves and cause death fairly rapidly. Older plants, which have had a chance to put away reserve foodstuffs in their lower stems and roots, must absorb the weedkiller and carry it down to the roots before a kill can be assured.

Absorption takes place largely through the surface of the leaf. It is, therefore, desirable to use sufficient of the spray solution to thoroughly wet the leaf surface, at least the top surface, and for waxy leaves the spray should carry a spreader and sticker. Most of the hormone weedkillers on the market have such an agent already mixed with them.

* Formerly Agrostologist, Division of Plant Industry.

Once absorbed into the leaf, the hormone travels downwards with foodstuffs manufactured in the leaves. Hence, the greatest amount of hormone is usually moved downwards when food formation and movement is greatest. This occurs when the plant is growing vigorously, usually well before seeding, and, for our major weeds, in warm sunny weather.

The leaves and stems must be allowed to remain on sprayed plants to ensure movement of the hormone to the basal portions. Do not brush or mow for at least a week after spraying and even then do not remove the plant too close to the ground. In some cases there is an immediate severe or even complete falling of leaves following spraying. This is an unfortunate occurrence, for it means that the plant is unlikely to absorb sufficient hormone through its stems to produce a kill. Another spraying when the plant recovers is required.

Many woody plants have a high proportion of leaves that do not function vigorously in food manufacture. For best results against such plants it is desirable to stimulate the production of young, active leaves by such means as brushing and burning. The regrowth is then sprayed when growing actively, the hormone thus being taken into the leaves and freely moved to the food storage organs. This applies to shrubby weeds such as groundsel bush and lantana.

Types of Hormone Weedkillers.

There is a variety of types of hormone weedkiller, most being prepared from phenoxyacetic acids. The brands on the market in Queensland, and the form in which they are made, are as follows. The content of active constituent is given as pounds or percentage of 2,4-D:—

Liquids, to be diluted with water.

"Methoxone," containing the equivalent of 1 lb. of 2,4-D in each gallon. (Distributors—A.C.F. and Shirleys Fertilizers Ltd., Little Roma street, Brisbane.)

"Hormex," containing the equivalent of 5 lb. of 2,4-D in each gallon. (Distributors—Wilcox Mofflin Ltd., Barry parade, Brisbane.)

"Weedone," containing the equivalent of nearly 1 lb. of 2,4-D in each gallon. (Distributors—Pope, Mayne and Southerden Pty. Ltd., 300 Adelaide street, Brisbane.)

Powders, to be dissolved in water.

"Vallo 2,4-D," containing 82% 2,4-D—that is, over $\frac{4}{5}$ lb. 2,4-D in 1 lb. of powder. (Distributors—A. Victor Leggo Pty. Ltd., 185 Mary street, Brisbane.)

"Hardy's 2,4-D," containing 77% 2,4-D—that is, just over $\frac{3}{4}$ lb. 2,4-D in 1 lb. of powder. (Distributors—Brett and Company Pty. Ltd., Grey street, South Brisbane, and International Traders, 228 Roma street, Brisbane.)

"2,4-Diweed," containing 70% of 2,4-D—that is, slightly less than $\frac{3}{4}$ lb. of 2,4-D in 1 lb. of powder. (Distributors—H. Blaiklock & Co. Pty. Ltd., 150 Mary street, Brisbane.)

Dust form, mainly for lawns.

"Weedust," containing 1 lb. 2,4-D in 50 lb. of dust. (Distributors—Pope, Mayne and Southerden Pty. Ltd., 300 Adelaide street, Brisbane.)

Prices of hormone weedkillers range from about 18s. per lb. of 2,4-D content upwards. Some are supplied at a concession price by the Department of Public Lands for Noogoora burr destruction only. All of the preparations listed will kill readily susceptible weeds such as Noogoora burr. Those with a spreader incorporated or in an oily form are most effective against waxy-leaved plants.

Quantity Required.

In the list of individual weeds given later, mention is made of concentrations recommended. At this stage it is desirable to make a brief general statement on quantities required. For all practical purposes there is a lower limit and an upper limit to the amount of weedkiller which can be used per acre of weed. Roughly, for an acre of weed which is sufficiently dense to require something like 100 gallons of spray solution, applied by means of a knapsack sprayer, from 1 lb. to 3 lb. of 2,4-D (or its equivalent) is necessary, the lower amount for easily killed weeds such as Noogoora and Bathurst burrs and the higher amount for more resistant species. Approximately one pound of 2,4-D is contained in 1 gallon of "Weedone" or "Methoxone," or in 1¼ to 1⅓ lb. of the powder preparations. One gallon of "Hormex" contains 5 lb. of 2,4-D.

Method of Application.

For farm and station purposes, the hormone weedkillers marketed in Australia are intended for application as sprays. Though equipment recently developed in the United States allows some types to be applied at the rate of 1 gallon of the weedkiller to 2 gallons of water per acre, such low-volume application is not yet practised in Queensland. The knapsack sprayer is commonly used, applying about 100-130 gallons of solution per acre, but the Lands Department has demonstrated that ordinary jetting plants can be employed with economy in the use of spray solution.

Precautions to be Taken.

There is no danger in using the hormone weedkillers on pastures or in other areas to which stock have access, as they are non-poisonous to animals. However, crops other than sugar-cane, cereals and grasses may be seriously damaged and direct application of sprays to such crops should not be made. Further, drifting of the spray on to these crops should be avoided, and spray equipment should be thoroughly cleansed as recommended by the manufacturers of the various preparations before it is used for insecticides or other spray purposes.

Susceptibility of Plants.

The following lists indicate the plants which may be readily killed, those which are killed under some circumstances, and those which are resistant. Some of the botanical names given are not strictly correct, but are those by which the weeds are most commonly known in Queensland.

READILY SUSCEPTIBLE—HIGH PERCENTAGE OF KILL IF SPRAYED UNDER RIGHT CONDITIONS.

ANNUALS.

	Per acre.
Asthma plant (*Euphorbia pilulifera*)	1 lb.
Bathurst burr (*Xanthium spinosum*)	1 lb.
Bell vine (*Ipomaea plebeia*)	1 lb.
Bluetop or billygoat weed (*Ageratum conyzoides*)	1 lb.
Bullhead or cathead (*Tribulus terrestris*)	1 lb.
Burr trefoil (*Medicago denticulata*)	1 lb.
Chicory (*Cichorium intybus*)	1 lb.
Cobblers' pegs (*Bidens pilosa*)	1 lb.
Dead nettle (*Lamium amplexicaule*)	1 lb.
Devil's claws (*Martynia* spp.)	1 lb.
Fennel (*Foeniculum vulgare*)	1½ lb.
Hexham Scent (*Melilotus parviflora*)	1 lb.
Horehound (*Marrubium vulgare*)	1 lb.
Mallow (*Malva parviflora*)	1½ lb.
Milk thistle (*Sonchus oleraceus*)	1 lb.
Milkweed (*Euphorbia drummondii*)	1 lb.
Mint weed (*Salvia reflexa*)	1 lb.
Noogoora burr (*Xanthium pungens*)	1 lb.
Oriental rocket (*Sisymbrium orientale*)	1 lb.
Pigweed (*Portulaca oleracea*)	1 lb.
Prickly lettuce (*Lactuca scariola*)	1½ lb.
Ragweeds (*Erigeron canadensis* and *E. linifolius*)	1½ lb.
Red caustic creeper (*Euphorbia prostrata*)	1½ lb.
Saffron thistle (*Carthamus lanatus*)	1½ lb.
Shepherd's purse (*Capsella bursa-pastoris*)	1 lb.
Spiny emex or double gee (*Emex australis*)	1½ lb.
Staggerweed (*Stachys arvensis*)	1 lb.
Star burr (*Acanthospermum hispidum*)	1 lb.
Stinking Roger (*Tagetes glandulifera*)	1 lb.
Texas sage (*Salvia coccinea*)	1 lb.
Turnip weed (*Raphanus raphanistrum*)	1 lb.
Wild hop (*Nicandra physaloides*)	1½ lb.
Wild radish (*Rapistrum rugosum*)	1 lb.
Wireweed (*Polygonum aviculare*)	2 lb.
Yellow weed (*Galinsoga parviflora*)	1 lb.

BIENNIALS AND PERENNIALS.

Bindweed (*Convolvulus arvensis*)	2 lb.
Bryophyllum (*Bryophyllum calycinum*)	1 lb.
Carrot weed (*Daucus glochidiatus*)	1 lb.
Castor oil plant (*Ricinis communis*)	1 lb.
Common vervain (*Verbena officinalis*)	2 lb.
Devil's apples (*Solanum sodomaeum*)	2 lb.
Dodder (*Cuscuta australis*)	2 lb.
Duckweed (*Lemna oligorrhiza*)	1 lb.
Flannel weed (*Sida cordifolia*)	2 lb.
Flatweed (*Hypochaeris radicata*)	1 lb.
Gomphrena weed or soft khaki weed (*Gomphrena celosioides*)	2 lb.
Groundsel-bush (*Baccharis halimifolia*)	2 lb.
Guava (*Psidium guajava*)	2 lb.
Hemlock (*Conium maculatum*)	1½ lb.
Hoary cress (*Lepidium draba*)	2 lb.
Indian weed (*Siegesbeckia orientalis*)	2 lb.
Inkweed (*Phytolacca octandra*)	2 lb.
Khaki weed (*Alternanthera repens*)	1 lb.
Lantana (*Lantana camara* and *L. sellowiana*)	2 lb.
Mexican clover (*Richardsonia scabra*)	1 lb.
Morning glory (*Ipomaea purpurea*)	1 lb.
Mullumbimby couch (*Kyllinga monocephala*)	2 lb.
Needle burr (*Amaranthus spinosus*)	2 lb.
Paterson's curse (*Echium plantagineum*)	1 lb.
Pennyroyal (*Mentha satureoides*)	1 lb.
Pennywort (*Hydrocotyle asiatica* and *H. laxiflora*)	1 lb.
Pepperwort (*Lepidium ruderale*)	1½ lb.

Pink-flowered Chinese burr (*Urena lobata*)	2 lb.
Plantains (*Plantago* spp.)	1 lb.
Poinsettia (*Euphorbia pulcherrima*)	1½ lb.
Purple-top (*Verbena bonariensis*)	2 lb.
Scotch thistle (*Cirsium lanceolatum*)	2 lb.
Star of Bethlehem (*Ipomaea quamoclit*)	1½ lb.
Star thistle (*Centaurea calcitrapa*)	2 lb.
Streaked rattlepod (*Crotalaria striata*)	1½ lb.
Swinecress (*Coronopus didymus*)	1½ lb.
Variegated thistle (*Silybum marianum*)	2 lb.
Wandering Jew (*Commelina cyanea*)	2 lb.
Water hyacinth (*Eichornia crassipes*)	2 lb.
Weir vine (*Ipomaea calobra*)	2 lb.
White clover (*Trifolium repens*)	2 lb.

SOMEWHAT SUSCEPTIBLE, BUT PERCENTAGE KILL VERY VARIABLE.

Black pigweed (*Trianthema portulacastrum*).
Common thorn apple or stramonium (*Datura stramonium*).
Crofton weed or mist flower (*Eupatorium riparium*).
Devil's fig (*Solanum torvum*).
Fat hen (*Chenopodium album*).
Fishweed (*Chenopodium triangulare*).
Green amaranth (*Amarantus viridis*).
Green cestrum (*Cestrum parqui*).
Lilac-flowered oxalis (*Oxalis corymbosa*).
Mexican or prickly poppy (*Argemone mexicana*).
Nut grass (*Cyperus rotundus*).
Redheaded cotton bush (*Asclepias curassavica*).
Sensitive plant (*Mimosa pudica*).
Sida retusa or Paddy's lucerne (*Sida rhombifolia*).
Tick trefoil (*Desmodium triflorum*).
Upright mist flower (*Eupatorium adenophorum*).
Veined vervain (*Verbena venosa*).
Waterpepper (*Polygonum hydropiper*).
Wild tobacco (*Solanum auriculatum*).

RESISTANT, OR PERCENTAGE KILL VERY SMALL.

Bracken fern (*Pteridium aquilinum*).
Cape gooseberry (*Physalis peruviana*).
Fumitory (*Fumaria parviflora*).
Galvanised burr (*Bassia birchii*).
Ground cherries (*Physalis* spp.).
Long-spined thorn apple (*Datura ferox*).
Milky cotton bush (*Asclepias fruticosus*).
Wild verbena (*Heliotropium amplexicaule*).
Yellow oxalis (*Oxalis corniculata*).
All true grasses, such as couch grass, mat grass, Johnson grass, burr grasses, blady grass, sour grass, spear grass, etc.

CROP PLANTS WHICH MAY BE DAMAGED.

Beans.	Carrot.	Stone and pip fruits.
Beetroot.	Lucerne.	Onion.
Cabbage.	Flax.	Pineapple.
Cauliflower.	Cotton.	Banana.
Tomatoes.	Tobacco.	Pumpkin.
Radish.	Grapes.	
Turnip.	Citrus.	

CROP PLANTS RESISTANT TO ORDINARY STRENGTHS.

Wheat, Oats, Barley.	Maize.	Sugar cane.
	Sorghum.	Millets.

VEGETABLE PRODUCTION

Tomato Variety Investigations in the Stanthorpe District.

A. A. ROSS, Horticulturist, Horticulture Branch.

(*Continued from page* 142, *September,* 1948.)

Group 2.

Varieties included in this group may produce quite satisfactory yields of good quality fruit if growing conditions meet their requirements, but in general they are not as reliable as those in Group 1. Brief mention of their most outstanding characteristics will be sufficient to indicate their suitability or otherwise for any particular set of conditions.

Bounty.

A first-early variety which matures its fruit in a comparatively short period. It has a dwarfed, compact, determinate bush which is somewhat unthrifty and requires the best of soil and weather conditions to produce a reasonable yield. The fruit is of excellent quality, has a good appearance, and carries well. It is rather susceptible to leaf diseases, having freely contracted target spot and bacterial spot in trials while other varieties have remained comparatively free. It is, however, resistant to sunscald despite the open habit of the bush. On account of its dwarf habit it could be planted as close as 3 ft. by 4 ft., which would have an appreciable effect on the yield per acre.

Break o' Day.

An early variety with a fairly extended cropping period. Selected strains do well as an early crop if weather conditions are suitable, but droughty conditions produce severe radial and circular cracking. The open habit of the vine induces a considerable amount of sunscald, which is accentuated by the fact that in this district the crop is wholly summer grown.

Essary.

A mid-season variety with a vine of spreading habit and rather sparse foliage. In local trials, early pickings were light but later pickings were very satisfactory. Fruit is of good quality, being deep globe shaped, smooth, and firm. The strains tested were somewhat variable but should improve with further selection. Indications are that it is resistant to Septoria leaf spot and tolerant to Fusarium wilt.

Garden State.

A mid-season variety with a large, vigorous vine. The fruit is large and firm but has a large corky ring at the stem attachment and is slightly angular in shape. The yield is good and the fruit carries particularly well. With further selection to improve its shape it will possibly develop into a valuable variety.

Marglobe.

A mid-season to late variety which produces excellent yields of good quality fruit when conditions are favourable, but when hot, dry weather prevails it cracks badly, particularly radially, at the stem end. Its carrying capacity is not equal to that of the Group 1 varieties.

Marhio.

Two strains are commonly grown in this district—the pink and the red. The pink is the original selection from Marglobe. Both produce fruit of excellent quality and size, and their cropping capacities are reasonably good. Like the parent variety, Marglobe, they are subject to cracking under adverse conditions, and their yields are not of the same order as Group 1 varieties, setting being rather poor in cool weather. The pink strain is at a disadvantage from the market point of view.

Marvana.

This variety failed to produce reasonable yields in most trials and, in addition, the fruit is slightly ribbed and flat in shape. Given good growing conditions average crops can be expected, but general planting with this variety cannot be recommended.

Matchless.

A variety producing fruit of good size and shape, but they are soft and of poor carrying capacity. The yield is fairly good but it can only be considered a second-rate variety.

Norton.

A late-maturing variety selected because of its resistance to Fusarium wilt. Fruit are of good size and appearance but are too soft to carry well. Under hard growing conditions it becomes subject to blossom-end rot and catface. Yield is only fair and this can only be considered a second-rate variety.

Pearson.

A mid-season variety with a determinate habit. Fruit are of good quality, being large, smooth, and globe-shaped, but they tend to be somewhat soft. Under favourable conditions yields are very satisfactory, but under dry conditions the size of the fruit becomes very much reduced and a large proportion of the crop is too small to be marketed. Large fruit have the defect of having a heavy white fibrous core.

Penn Heart.

A first-early variety which has a dwarfed bush and crops very heavily. Fruit is of good quality but has the failing of being flat in shape, which interferes with mechanical grading and makes packing slightly more difficult. For growers who do not employ mechanical graders this variety should be very profitable as it can be planted as close as 3 ft. by 4 ft. and under such conditions will produce a large number of cases per acre. It is susceptible to wilt and produces some "catface" but is resistant to sunscald.

Penn State.

A dwarfed second-early variety somewhat similar to Penn Heart but flatter and slightly ribbed. Circular cracking is common. It does not yield as well as Penn Heart and cannot be recommended in preference to it.

Pritchard.

Very similar to Pearson, having a compact determinate bush, but the quality of fruit is not so good. It shares the failing that under dry conditions the size of fruit is so reduced as to render a large proportion of it unsaleable.

Riverside.

A variety with a large, dense bush which carries large, globe-shaped fruit. The majority of fruit is of marketable size and it yields reasonably well under good conditions, though it is somewhat inferior to Group 1 varieties in this respect. It has been specially developed for its resistance to Verticillium wilt.

Rutvel.

A selection from the progeny of a cross made in Queensland in 1939 between Rutgers and Marvel in the course of a breeding programme designed to develop varieties resistant to Fusarium wilt. It is a second-early variety with a fairly well extended cropping period. The vine is non-determinate, open, sprawling, and of medium size. The fruit is of uniform, desirable size and typically globe-shaped. It is firm, has a good appearance, and carries well and therefore meets market requirements very satisfactorily. Rutvel is, however, less successful under adverse conditions than the varieties included in Group 1. The recommended planting distance is 6 ft. by 6 ft.

Stone.

As one of the parents of Globe, this variety is an ancestor of many of the present day types and produces reasonably good yields of quite attractive, large fruit. The fruit are, however, rather thin-skinned and the walls are thin, which impairs its carrying capacity. Thus, for Stanthorpe conditions, it cannot be recommended.

Group 3.

Varieties included in this group are much inferior to those of Group 1 in regard to both cropping capacity and quality of fruit. They

may, however, be useful for certain purposes and, therefore, cannot be condemned outright. The following notes will indicate their behaviour under Stanthorpe conditions:—

Coventry.—A poor cropper of small fruit with a tendency to crack badly.

Denisonia (*Bowen Buckeye Globe*).—A very late-maturing variety, success of which depends to a large extent on the weather. The size and the quality of the fruit are good, though sometimes it becomes rather puffy. Its cropping capacity is much less than that of Group 1 varieties.

Firesteel.—A variety producing good quality fruit of desirable size and shape, but the vine is not particularly vigorous and the incidence of spotted wilt has been high in all trial plots.

Indiana Baltimore.—A small-fruited, light-yielding variety which suffered severely under droughty conditions in all trials.

Marvelosa.—A pink-fruited variety which yielded lightly and showed little promise. Size and shape of fruit are satisfactory, but it is inclined to be puffy.

Nystate.—A variety which suffered severely from drought, producing small fruit and light yields. Under better conditions the fruit becomes larger in size but is soft and liable to break down in transit.

Orange Prolific.—A late-maturing, corrugated Chinese variety, which showed little promise. The shape is not as poor as many of the Chinese varieties but its yielding capacity is not sufficiently good to make it worthwhile.

Red Cloud.—Resembling Sioux in outward appearance, the variety produces very firm fruit of excellent size and shape. However, cropping capacity is much inferior to that of Sioux.

Group 4.

Members of this group have performed consistently badly in all trials under Stanthorpe conditions. Each possesses at least one defect which renders it unsuitable for commercial purposes in this district.

Bonny Best.—A poor yielder of soft fruit, particularly susceptible to blossom-end rot and Fusarium wilt.

Burbank.—A flat, ribbed fruit subject to blossom-end rot and catface.

Early Wonder.—A selection of Earliana displaying most of the disadvantages of this variety. It yields poorly and produces badly shaped fruit susceptible to catface and cracking.

Guernsey Beauty.—One of the cluster varieties whose fruit, though slightly larger than average for this type, is still too small to be considered a valuable market variety.

H.E.S. 927.—An unthrifty variety giving a poor yield of small fruit.

Morse's Improved.—Another unthrifty variety giving a light yield of small fruit.

Pan America.—Exhibiting a very high resistance to Fusarium wilt, this variety offers possibilities as a parent for breeding purposes. As a variety, in itself, it produces fruit of quite good quality and size but the yield is disappointingly low.

Potentate.—One of the better cluster varieties which, though producing fruit too small for market under Stanthorpe conditions, would perform well in home gardens.

Recruit.—One of the cluster varieties with no particular attributes.

Rouge de Marmande.—A Chinese variety with very good cropping capacity, but the shape of the fruit is very irregular and the variety is very susceptible to blossom-end rot.

Sensation.—A late-maturing cluster variety with no special characters to commend it.

Stambovoi Alpatev.—A dwarf type introduced from Central Europe, not at all suited to Stanthorpe requirements.

Stemless Penn Orange.—A relatively shy-bearing variety producing very firm, deep-globe shaped, and slightly grooved fruit of an orange colour. This colour would have an adverse effect on their market value.

Stemless Penn Red.—A fairly small, compact bush with fruit of good size, globe-shaped, firm, smooth, and ripening to a bright red colour. The upper hands do not bear well and as a whole the yield is light.

Tatinter.—A dwarf variety with somewhat crinkled and slightly flat fruit. Fruit are of medium size and it has a moderate cropping capacity. It is not suitable for commercial production for the fresh fruit market under Stanthorpe conditions but would possibly be a satisfactory variety for the home garden.

Tatura Dwarf Globe.—A dwarf variety whose fruit are mainly too small for market requirements. It has thin walls and a tender skin and, therefore, does not carry well. Its yield is reasonably good and it would provide a worthwhile home garden variety.

Wanneroo Late.—Producing a moderate yield of medium to small-sized, smooth and flat-globe shaped fruit, this variety showed no outstanding qualities.

Wasatch Beauty.—Showing poor resistance to drought conditions and producing a light yield of small fruit, this variety appeared to have little to commend it for local conditions.

Washington State.—A forcing variety bred for glasshouse culture, and, therefore, suited mostly for staking. Under Stanthorpe conditions fruit were small and the crop light.

SUMMARY.

The Stanthorpe district is one of the State's most important tomato producing areas, particularly since crops are harvested there during the summer and autumn months. It is necessary to select a variety

adapted to local requirements in order to produce maximum yields in this district. Plants must be grown on the ground, and varieties resistant to sunburn and the common leaf diseases are to be preferred.

The market demands a smooth, round fruit of 2¾-in. to 3-in. diameter with good carrying capacity.

Cluster type varieties usually produce an abundance of fruit which is too small for market requirements, while Chinese or Flat Corrugated varieties are unacceptable on account of their irregular shape. Large, smooth, round varieties constitute the only type which meets the whole set of local conditions.

Fusarium wilt is not a troublesome disease in this district and varieties resistant to the disease are not essential at present.

The four varieties included in Group 1.—Sioux (early), Grosse Lisse (mid-season), and Rutgers and Valiant (late)—are high yielding, excellent quality tomatoes. They are specially adapted to Stanthorpe conditions as they crop heavily and consistently and meet market requirements very satisfactorily.

Certain other varieties produce reasonably good crops when seasonal conditions are favourable but may fail under hard conditions.

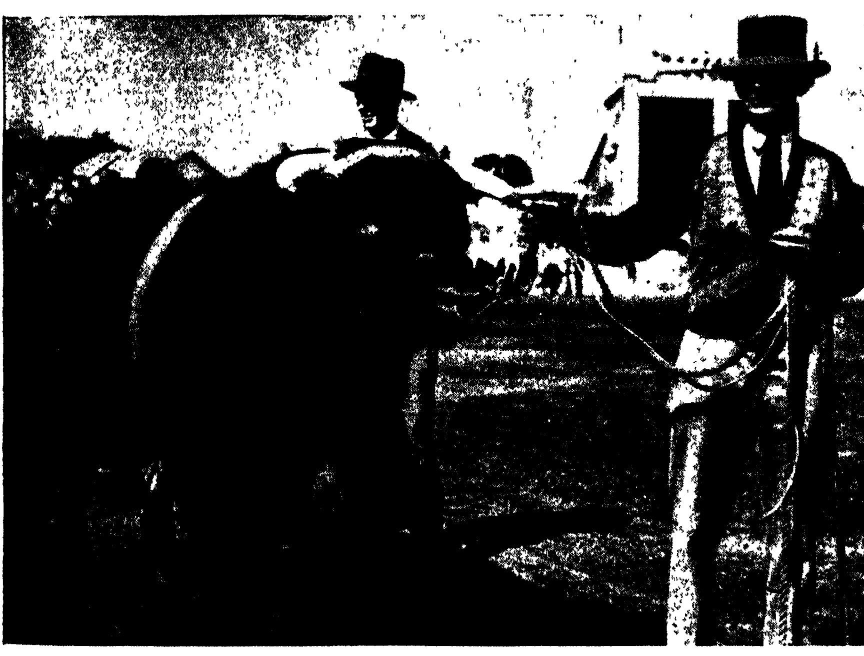


Plate 61.

On Parade at the Royal Show.

PLANT PROTECTION

Fruit-spotting Bug as a Pest of the Macadamia or Queensland Nut.

A. R. BRIMBLECOMBE, Entomologist, Science Branch.

THE Macadamia nut* is a highly nutritious food and is one of the richest oil-bearing nuts known. Its cultivation as a commercial crop is extending in Queensland, where quality nuts are assured of a ready market. Continuity of yield, however, largely depends on the control of several insect pests, such as the Macadamia flower caterpillar† and the Macadamia nut grub.‡ Attention is now drawn to an additional insect pest, a fruit-spotting bug,§ which has extended its activities from other fruit crops to the Macadamia nut, causing serious premature nutfall and nut malformation.

Host Plants and Distribution.

The fruit-spotting bug was first recorded from bananas in the central coastal fruit areas, where it causes a serious fruit spotting. Later it was recognized as a pest of papaws, causing fruit-spotting as well as severe stunting and crinkling of the young growth. Other cultivated and introduced plants on which the bug is known to feed are cassava, citrus, mango, pineapple, cotton, custard apple, granadilla, passion fruit, white passion flower, corky passion flower, beans of various kinds, Palay rubber vine, frangipanni, and Noogoora burr. The native host plants include white cedar, rough leaf fig, orange boxwood, *Pisonia brunoniana, Peltophorum ferrugineum,* and *Guoia semiglauca.*

Originally the fruit-spotting bug was an inhabitant of the rain-forest. Its early records were from bananas and later papaws grown in rain-forest areas, but it has since spread widely into other agricultural districts. It is now distributed throughout the eastern coastal fruit belt, though in the past it has been most troublesome in the northern and central districts.

Life History.

The fruit-spotting bug during its life passes through seven stages, namely the egg, five nymphal stages and the adult. The egg is oval in shape, about one-fifteenth of an inch in length, and pale green in colour with a slight opalescence. From it hatches the pear-shaped first stage nymph which is greenish in colour with two prominent dark spots on the

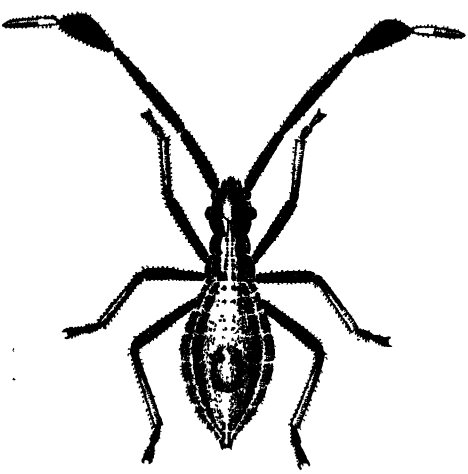
* *Macadamia ternifolia* and its varieties.

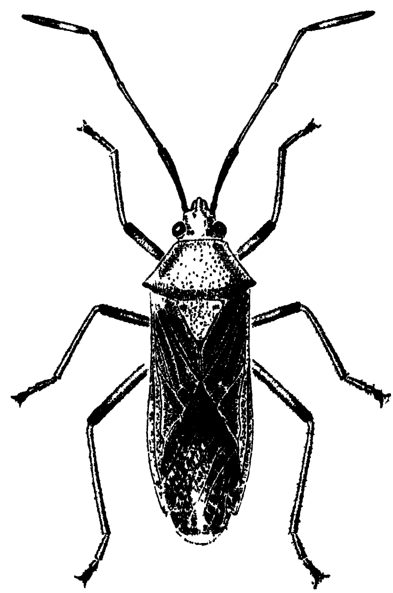
† *Homoeosoma vagella* Zell.

‡ *Arotrophora ombrodelta* Lower.

§ *Amolypelta lutescens* Dist.

abdomen. The second, third (Plate 62) and fourth stage nymphs are also pear-shaped, each a little larger than the preceding stage. Each is mostly greenish-orange in colour, again with the two prominent dark spots on the abdomen. The flattened second-last joint of the long black antennae is also a prominent feature. The fifth stage nymph is elongate-oval and more comparable to the adult than to the earlier nymphal stages. Its colour is pale green and it also possesses the characteristic features of the earlier stages. Slight swellings representing the wing-buds are at first noticeable on the third stage nymph and become more conspicuous on the fourth and fifth stages. Change from one stage to another takes place by moulting, when the skin splits along a noticeably clear line down the centre of the back. When the fifth stage nymph moults it produces the mature winged adult bug (Plate 63), which is of slender build, about half an inch in length and usually pale green in colour.





[*Drawings by William Manley.*

Plate 62.

FRUIT-SPOTTING BUG.—Third stage nymph x 6½.

Plate 63.

FRUIT-SPOTTING BUG.—Adult x 3.

During the summer the egg hatches in six or seven days. The first stage nymph completes its growth in three or four days, the second stage in four to six days, the third in six or seven days, the fourth and fifth each in five to seven days. The period required for complete development from laying of eggs to emergence of adults varies mostly from 34 to 38 days. During the summer months adults have lived for periods ranging up to 54 days, while over the winter months they may live for more than 150 days. One female over the summer period laid as many as 163 eggs.

Breeding work has indicated that in south-eastern Queensland the bug may pass through three generations each year—a spring, a summer and an autumn generation. The adults of the autumn generation live through the winter and commence egg-laying in the spring.

Habits.

Eggs of the spring generation are probably laid on the young foliage and those of the summer generation on the young nuts. Those of the autumn generation are probably laid on the nuts and perhaps also on the foliage. The eggs are placed singly on the host plant and only a few are laid by the one female each day.

Plate 64.
PREMATURELY FALLEN NUTS UNDER A BUG-INFESTED TREE.

The nymphs have comparatively long legs, especially in the earlier stages, when they stand erect with the thorax and head angled upwards. The first two stages are always alert and active and can detect moving objects some distance away. When approached, they quickly move to secluded positions and if on the nuts they move within the shelter of the nut clusters. The later nymphal stages are not so active but readily move to sheltered places when they are disturbed. Early in the morning all stages, especially the adults, are somewhat sluggish. Later in the day the adults are always alert. They hide in the nut clusters or quickly make short flights to other parts of the tree, later returning to the nuts.

The fruit-spotting bug feeds by sucking. The rostrum or beak is normally held under the body but is held upright on the surface of the nut when the insect is about to feed. When the stylets or sucking tubes which are enclosed in the rostrum are inserted into the plant the rostrum is again flexed under the body. On small nuts the stylets are inserted for only part of their length but on larger nuts they penetrate to their full length and thus feeding takes place on the nut kernel.

Nature and Effect of the Damage.

An outstanding feature of fruit-spotting bug attacks on Macadamia nut trees is that comparatively few insects per tree can cause an enormous amount of damage. Both adults and the immature stages may feed on young shoots and on the nuts.

Injured shoots show severe wilting. Sucking insects normally do not cause wilting unless they are present in large numbers on the plant. The fact that one fruit-spotting bug per shoot can cause collapse of the shoots indicates that feeding must be accompanied by the injection of a toxin into the plant tissue. Although shoots are killed in this way, the health of the tree is not affected.

The occurrence of the bugs on the nut clusters has far greater economic consequences. Only a small number of bugs per tree can cause almost complete loss of the crop. Usually the first indication of bug activity is a heavy premature nutfall (Plate 64), a feature similar to that caused by a related species of bug on coconuts in the Solomon Islands. Young nuts up to the size of a marble readily fall when pierced. Older nuts may have to be pierced more than once before they fall, while others though pierced several times may remain on the tree. The older the nut the less likely it is to fall. No external sign of damage is shown on the husk and the excessive nutfall might easily be attributed by mistake to weather or some other cause.

When sectioned, freshly fallen young nuts, up to the size of a marble, show no sign of injury on or in the husk. On the outer side of the shell there is a watery-white spot from which a brown hair-line leads through the soft white tissue to a pale brown area on the inside of the shell. The kernel, instead of being firm in texture and milk white in appearance, becomes jellied and resembles stiff boiled starch. Often when nuts fall while the shell is still soft and white, the tissue surrounding the puncture collapses in an irregular area sometimes up to half an inch across (Plate 65, bottom row). It then shrinks until of only paper thickness and sometimes splits. The kernel also jellies and finally shrivels to a small, shapeless, dry brown structure (Plate 66, top row). A little extra tissue may develop on the inner side of the husk, filling the depression in the shell. In still older nuts, in which the shell is beginning to harden and turn brown, only small depressions develop on the outer and inner surfaces of the shell (Plate 65, middle row), or there may be only a pin point mark on the outer surface (Plate 65, top row), and only part of the kernel may become shrivelled (Plate 66, middle row). Others again show no sign of injury on the shell, though the kernel may be completely or partially affected—at any rate unsuitable for commercial purposes (Plate 66, two nuts in bottom row). Secondary rots or mould development in the shrunken kernels is unusual, and before the fruit-spotting bug was known to attack the nuts the injury was diagnosed as internal collapse due to some unknown cause.

The premature nutfall, the collapse of the shell tissue and the atrophy of the kernel with only a minimum of puncturing clearly indicate that feeding of the bugs is accompanied by the injection of a toxin into the shell and kernel tissues and that the toxin must be very potent. It is obvious therefore that only a few bugs moving actively about for a comparatively long period among the thickly clustered nuts can cause severe loss or damage of nuts and in fact as few as 10 or 12 bugs per tree can ruin the crop.

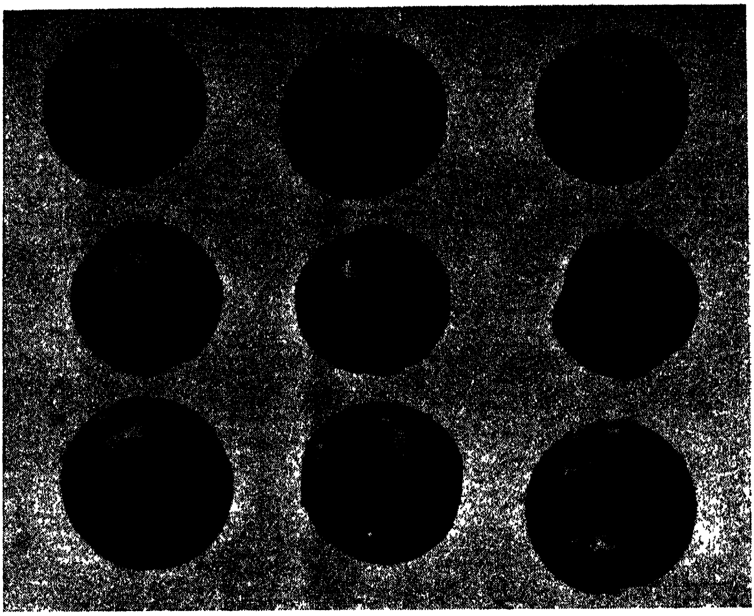


Plate 65.

Nuts Showing Bug Injury to the Shell.—*Top row*: Pinpoint marks, small depressions, and a large depression on the shell. *Middle row*: Partial collapse of the shell. *Bottom row*: Several small surface depressions and severe shell collapse.

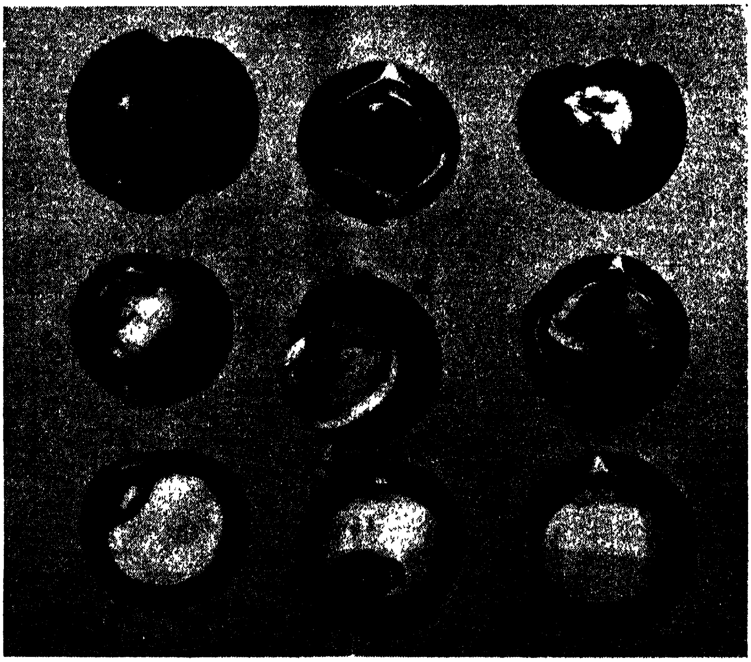


Plate 66.

Nuts Showing Bug Injury to the Kernels.—*Top row*: Shrivelled kernels and collapsed shells. *Middle row*: Partially shrunken kernels. *Bottom row*: Lightly injured kernels together with a perfect kernel.

Control.

Methods of combating the fruit-spotting bug on bananas and papaws by the use of DDT sprays should be quite suitable for bug-infested Macadamia trees. In recent years many nut growers have adopted a routine treatment for preventing the attacks of the flower caterpillar. This pest can readily be kept in check by DDT sprays applied just before or during flowering. If these treatments are applied to the whole tree, any bug on the shoots at this time will be killed and attacks on the nuts may not occur unless the insects migrate into the plantation from other hosts in the vicinity. The grower, however, should always be watchful for the bugs on the nut clusters, but as they may be few in number and escape detection they must be suspected if premature nut-fall occurs. Should, on examination, the fallen nuts show the shell or kernel damage described earlier a treatment of 0·2 per cent. DDT spray should be made and a second treatment applied a fortnight later.

It may be desirable also to survey the surrounding areas to determine whether the bugs are moving into the plantation from other hosts. If they are, then these plants should be destroyed if at all practicable or sprayed twice with DDT in the same manner as the plantation trees.

Pasture Grub Experiments.

On the Atherton Tableland there were indications last year that white grubs might be troublesome in pastures during the summer of 1947-48. It was decided, therefore, to investigate the possibility of using benzene hexachloride (BHC) for the control of this pest in pastures. The insecticide gives good control of related pests attacking cultivated crops such as sugar-cane when applied either at the time of planting or as a side-dressing later. The control problem in pastures is much more complicated, for it is not easy to get the insecticide into the soil horizon where the grubs occur.

The investigation has three phases. The first is to demonstrate the practicability of treating potential egg-laying sites on the farm so that beetles will be killed when they begin to lay their eggs. These sites are fairly well defined along fence lines, around fallen timber, and in the vicinity of Scotch (spear) thistles which flourish in areas where the grass is thin.

The second phase is to treat the known infested areas—that is, where the turf is damaged—before the spring flight, in the hope that the beetles will be destroyed as they emerge from the ground. A considerable beetle mortality usually follows such treatment.

The final phase is to destroy the white grubs in the field before the rapidly-growing larvæ move laterally and cause extensive damage.

The subject requires a long-term investigation. This was established during the spring of 1947, but results of the trials will not be available for comment for some time yet.

The Light Brown Apple Moth *

A. W. S. MAY, Entomologist, Science Branch.

DURING the latter part of the 1947-48 season, an unusually severe outbreak of the light brown apple moth occurred in the Granite Belt and both apples and grapes were affected. Though this insect has been recorded from the district for a number of years, the severity of last season's infestation raised the question of its future importance. However, since coincident outbreaks of the moth occurred in the southern States, it is probable that the severe outbreak was a purely seasonal phenomenon.

Though it is closely allied to the codling moth, the habits of this insect are quite dissimilar. It attacks a wide range of economic plants, including apples, grapes, apricots, plums and lupins, and it has been bred from several native trees and shrubs. The availability of suitable alternative hosts within the district raises the possibility that similar outbreaks may be experienced in the future should conditions favour the development of the pest. Consequently, control measures may be required and the following additions to the pest control programme may warrant consideration. However, the success of these measures on the crop is dependent to a large extent on the amount of reinfestation that may occur from moths breeding in alternative hosts.

CONTROL MEASURES.

Apples.

The larvae of the light brown apple moth are primarily leaf feeders and they shelter in webbing tunnels in leaf folds or between adjacent leaves. Unless their food supply has become exhausted they seldom wander far from their shelters, and this habit tends to render control somewhat difficult.

The normal lead arsenate or DDT cover spray schedule for codling moth control should also check this pest early in the season, but as the moth is particularly active throughout February and March the final codling moth cover spray may have been applied before the autumn brood of larvae becomes active on the trees. A spray containing ·05 per cent. DDT combined with lead arsenate (3 lb. in 100 gallons water), applied in late February or early March, should serve to protect late-maturing apples. This combination spray may also be substituted for earlier DDT cover sprays if so desired.

Grapes.

Larvae may infest developing bunches in appreciable numbers. They spin their webbing between adjacent berries, and are somewhat difficult to detect as the damage is usually confined to the rinds of inside berries. Juice exuding from the damaged rinds of more forward berries furnishes ideal conditions for early mould development, and as bunches mature losses from grey mould are accentuated.

Control should be commenced before the early summer generation of caterpillars reaches maturity, and the inclusion of lead arsenate or 0.1 per cent. DDT in copper sprays used for fungus control should prove beneficial. As bunches develop and spray residues must be avoided, the application of a dust containing one part of 10 per cent. DDT dust to four parts of sulphur should further assist in the control of this pest.

* *Tortrix postvittana* Walk.

Big Bud in Tomatoes.

J. E. C. ABERDEEN, Pathologist, Science Branch.

BIG bud disease is probably known to all regular tomato growers. It is difficult to describe the appearance of the infected plant in words, but the accompanying photograph illustrates the most common symptom and makes obvious the reason for the name of "big bud" (Plate 67). A second class of symptom seen is that known as "rosetting." In the latter case shoots normally produced in the leaf axil appear as a bunched mass of small narrow leaves. Prior to these rather obvious symptoms there is actually a cessation in growth of the stem which is often followed by a blueing of the growing tip, and the flower hands instead of curving downwards tend to point upwards. The bizarre forms leading to the name "big bud" are malformed flowers in which the stalks have thickened considerably and the flower itself become grossly distorted, while the entire hand remains a green colour.

Plate 67.

Big Bud of Tomato.

Spread of the Disease.

Usually a grower sees only an occasional plant affected with this trouble but in some districts there is a definite possibility of an appreciable economic loss. There are two important points to be noted with regard to its entry into the crop and subsequent spread:—

(1) The disease almost always enters the tomato crop from other hosts outside the crop itself.

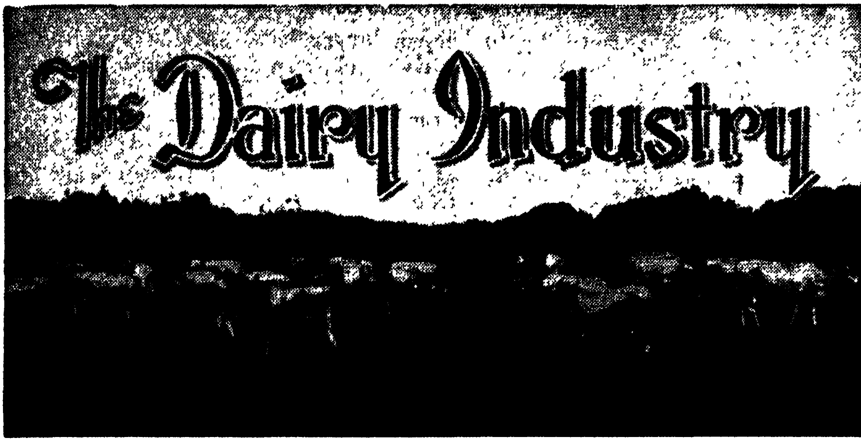
(2) It is spread by an insect and not by handling, which is in contrast to mosaic.

On hosts other than tomato the "big bud" symptom is usually absent and the symptom common to most is that of green flowers. A rosetting effect is also fairly common. Well known plants which have been proved to be hosts in other States of Australia are weeds such as dock, nightshade, and sow thistle; and garden plants such as antirrhinum, gerbera, petunia, nasturtium, chrysanthemum, dahlia, geranium and phlox, and couch grass.

One insect has been proved to spread the disease and there may be others. The incriminated carrier is one of the leafhoppers or jassids. It is a small sucking insect approximately ⅛-inch long, of a grey-brown colour with speckled wings. The presence of leafhoppers generally is readily discerned by disturbing the bushes, which causes them to dart out for a short distance and then either return or lodge in the next bush.

Control.

In the light of the above information on the spread of the disease the simplest means of control is to reduce the outside sources of infection and control the leafhopper within the crop. Complete elimination of other hosts is not possible but it is suggested that particular attention be paid to eliminating weeds on the headlands. For control of the leafhopper within the crop either 0·1 per cent. DDT spray or 2 per cent. DDT dust may be used. While the insect is prevalent, treatments will need to be repeated approximately every 10 days. It is unlikely that treatment need commence before November in southern Queensland, but it is recommended that the grower take good note of the leafhopper population in the adjacent weed areas. If this is high and there are indications that the weed growth may die off due to dry conditions or otherwise, then dusting or spraying will need to commence earlier. The removal and destruction of diseased plants as soon as detected should also assist in reducing the spread, but it should be realised that the plant is actually infected at least three weeks before the appearance of the noticeable symptoms.



What Herd Recording Shows.

L. VERNEY, Division of Dairying.

IT is a recognised fact that dairy farming is a business, and should be run on business principles; nevertheless, on many dairy farms throughout the State one of the chief underlying principles of business—record keeping—is sadly neglected. Even when the dairy herd is the chief source of income, many dairy farmers do not keep accurate herd records. The keeping of these records requires a certain amount of time and labour, but it must be conceded that their value far exceeds the outlay and without them the highest type of dairy farming is rendered impossible.

Some of the reasons why the production of dairy herds should be recorded are:—

(*a*) It is the only way to find out what each cow actually pays for the feed provided, and the time expended in obtaining the milk she gives; it is the shortest way to build up a profitable herd of dairy cows.

(*b*) It enables the elimination of low producers to be carried out, and at the same time reveals the best cows from which heifer calves can be raised.

(*c*) It increases the sale value of good cows and, where pure bred recording is carried out, enables the breeder to sell bull calves from the high producing cows at attractive prices.

(*d*) It enables the dairy farmer to compare records of daughters with dams and to check up on the sire he is using.

(*e*) Where the herd is hand-fed in addition to pasturage it gives guidance as to how much each individual cow needs and furnishes helpful information for planning the feed crop rotations.

(*f*) It puts dairying on a sound business basis.

(*g*) It encourages increased pride and interest in the care of the dairy herd.

(*h*) It points out, and so helps to correct, sources of loss in dairying.

(*i*) It cuts out all guesswork.

(*j*) Better cows mean more profitable cows.

Many dairy farmers try to keep a larger herd on the principle of reducing overhead cost per unit of livestock. In following this line of unsound reasoning to the logical conclusion, they have developed their herds out of all proportion to their feed production and capital expenditure—in some cases to such an extent that they continually find themselves handicapped by a shortage of feed and funds. Consequently the low production of many cows is due largely to the low yield of both pastures and feed.

Owing to the lack of business training, many farmers assume that more cows will produce more milk. For example, they assume twelve cows produce more milk than ten cows. Now, if the supply of available feeds is limited to a fixed amount, and twelve cows would only have what the ten cows could just as well consume within the year, then it stands to reason that the twelve cows could be less profitable than the ten on account of the nutrients needed for the growth and maintenance of 20 per cent. additional cows, young stock included, and a waste of labour in like proportion.

The production recording of dairy cows provides information basic to successful dairy farming, and stimulates interest and gives a wider appreciation of the business side of the farmer's occupation.

Information on all matters appertaining to herd recording is available from the Department of Agriculture and Stock.

Plate 68.

A BRITISH GUERNSEY TYPE RECENTLY ACQUIRED BY THE NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING AT READING, ENGLAND.

Pure-bred Herd Recording for 1947-48.

S. E. PEGG, Senior Adviser (Herd Recording).

THE recording of pure bred cows showed a slight increase over the 1946-47 season, as 884 cows were due to complete their records compared with 708 for the preceding year.

Table 1 gives the number of cows in each breed which were due to complete their lactation during the year.

TABLE 1.

Breed.	Total.	Passed.	Failed.	Withdrawn.
A.I.S.	338	156 (46·1%)	70 (20·7%)	112 (33·1%)
Jersey	492	242 (49·2%)	116 (23·6%)	134 (27·2%)
Guernsey	36	16 (44·4%)	8 (22·2%)	12 (33·3%)
Ayrshire	18	7 (38·9%)	6 (33·3%)	5 (27·8%)
Friesian	Nil	..	..	..
Total	884	421	200	263
Percentage	..	47·6	22·6	29·7

It will be noticed that only 47·6 per cent. of the cows submitted reached the required standard.

The production records shown in Table 2 were established during the year.

TABLE 2.

Breed.	Age.	Days.	Owner.	Cow.	Milk lb.	Butter Fat lb.
A.I.S...	S2	273	J. Phillips and Sons	Sunnyview Beauty 6th	16,577	733
Jersey..	Mature	273	W. S. Conochie ..	Brooklands Cunning Drop	12,800	752
Guernsey	J3	273	W. A. K. Cooke ..	Bangalow Vale Vanity Fair 3rd	9,664	465
Guernsey	M	273	W. A. K. Cooke ..	Laureldale Vida ..	12,473	563
Guernsey	J3	365	W. A. K. Cooke ..	Laureldale Pamela	11,698	569

Table 3 shows the average production for each age group of each breed.

PURE BRED DAIRY CATTLE PRODUCTION RECORDING SCHEME.

BREED PRODUCTION AVERAGES FOR REGISTERED HERD BOOK STOCK WHICH COMPLETED LACTATION RECORDS OF 273 DAYS DURING THE YEAR ENDING 30TH JUNE, 1948.

	Ages of Groups.							
	J2.	S2.	J3.	S3.	J4.	S4.	Mature.	All Ages.
Jersey.								
Number of Cows	113	38	36	28	24	19	100	358
Average—Milk lb.	4,988	5,767	6,066	5,904	7,150	6,965	7,112	6,068
Butterfat lb.	263	300	325	315	346	381	374	320
Test %	5·27	5·2	5·36	5·33	4·84	5·47	5·26	5·27
Australian Illawarra Shorthorn.								
Number of Cows	41	43	32	26	18	11	55	226
Average—Milk lb.	6,849	7,347	8,466	9,062	9,313	10,094	9,444	8,413
Butterfat	266	296	346	361	370	392	373	335
Test %	3·88	4·03	4·09	3·98	3·97	3·88	3·95	3·98
Guernsey.								
Number of Cows	1	5	5	..	2	1	10	24
Average—Milk lb.	6,326	5,597	7,185	..	7,705	5,391	7,727	7,013
Butterfat lb.	319	274	349	..	398	283	375	344
Test %	5·04	4·89	4·86	..	5·16	5·25	4·85	4·9
Ayrshire.								
Number of Cows	2	1	2	4	..	1	3	13
Average—Milk lb.	6,646	5,456	6,058	7,132	..	7,561	8,826	7,187
Butterfat lb.	307	212	243	310	..	276	401	310
Test %	4·62	3·88	4·01	4·34	..	3·65	4·54	4·31

All ages and all breeds: Number of Cows, 621; Average Milk, 6,981 lb.; Average Butterfat, 326 lb.; Average Test, 4·67%.

Plate 69.
THE GREAT DIVIDING RANGE FROM THE KINGPAH PADDOCKS, WEST MORETON, QUEENSLAND.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the advanced register of the A.I.S., Guernsey and Jersey Societies' Herd Books, production records for which have been compiled during the months of June, July, August. and September, 1948. (273 days unless otherwise stated.)

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.	Month Compiled.
		Lb.	Lb.		
AUSTRALIAN ILLAWARRA SHORTHORN.					
MATURE COW (STANDARD 350 LB.).					
Fairlie Favourite 33rd (365 days)	Mitchell and Mulcahy, Rosenthal, Warwick	13,018·95	559·29	Rosenthal Perfection	June
Rozana Jason's Laurel	T. McLennan, Willowvale, *via* Warwick	11,898·6	461·113	Chelma Jason	June
Trevor Hill Blanche	G. Gwynne, Umbiram	10,609·45	427·149	Rosenthal Musketeer	June
Chelmer Nancy	T. McLennan, Willowvale, *via* Warwick	10,352·35	359·143	Thornleigh Young Lochinvar	June
Tabbagong Beauty 30th	J. Phillips, Wondai	17,628·35	638·348	Parkview Royalist	July
Glen Idol Florrie 7th	Estate P. Doherty, Glen Idol, Gympie	12,667·8	474·536	Blacklands Count	July
Glen Idol Daphne 6th	Estate P. Doherty, Gympie	11,759·75	465·663	Blacklands Count	July
Yarranvale Annabelle	W. Henschell, Yarranlea	10,926·02	443·072	Trevor Hill Bosca	July
Glen Idol Florrie 8th	Estate P. Doherty, Gympie	11,364·25	439·614	Blacklands Banker	July
Trevor Hill Caramel	G. Gwynne, Umbiram	9,079·04	437·081	Corunna Supreme	July
Yarranvale Melva	W. Henschell, Yarranlea	9,832·21	403·024	Trevor Hill Bosca	July
Ennismore Bud	E. W. Jackson, Nobby	10,371·2	398·728	Navillus Prince Henry	July
Jamberoo Glory 6th	Hart Bros., Clifton	10,989·95	351·054	Valiant of Greyleigh	July
Blacklands Ethel 22nd	A. Pickels, Proston	12,592	455·546	Blacklands Admiral	September
Sunnycrest Tulip	A. H. Sokoll, Wondai	9,595·75	394·56	Glebe Wallace 2nd	September
Barwin Lavender 4th	G. Meyers, Imbil	9,563·4	366·506	Blacklands Ethel's Viceroy	September
Bunya View Susy	W. J. Horrocks, Maclagan	8,239·85	362·458	Trevor Hill Reflection 143rd	September
Ardilea Kitty 5th	W. Hinrichsen, Clifton	9,385·75	357·224	Newstead Reliance	September
SENIOR, 4 YEARS (STANDARD 330 LB.).					
Alfa Vale Queenie (365 days)	W. H. Thompson, Nanango	17,028·35	658·324	Reward of Fairfield	June
Tara Plumber's Flower	C. K. Roche, Wheatvale	9,951·05	402·499	Alfa Vale Plumber	June
Jamberoo Marjorie 10th	Hart Bros., Clifton	11,160·95	437·811	Murray Bridges Flowers Prince	July
Fairthorn Pidgeon 12th	H. G. Watson, Killarney	8,214·9	368·893	Parkview Red Prince	July
Blacklands Lady Jean 25th	A. Pickels, Proston	10,932·25	368·396	Blacklands Czar	July
Tara Plumbers Flower (347 days)	C. K. Roche, Wheatvale	11,728·1	489·940	Alfa Vale Plumber	August
Melmerie Velvet 8th	C. K. Roche, Wheatvale	7,885·1	350 406	Rhodesview Primroy	August
Sunnyview Kitty 11th	A. Lohse, Biggenden	9,652·2	365·541	Sunnyview Kitchener	September
JUNIOR, 4 YEARS (STANDARD 310 LB.).					
Ennismore Freda	E. W. Jackson, Ennismore, Nobby	10,003·95	417·712	Navillus Prince Henry	June
Ennismore Florrie	E. W. Jackson, Ennismore, Nobby	9,710·1	383 902	Navillus Prince Henry	June
Arolla Polly 8th	J. Crookey, Allora	7,783·1	325·304	Parkview Highbrow	July
Cedar Valley Rosebud	A. C. Marquardt, Mondure	8,584·1	329·852	Kyabram Masterpiece	August
Balatar Maud	T. W. Fowler, Felton	8,297 62	329·767	Fairvale Dairyman	August
Bantry Sally	D. Sullivan, Bantry	10,090·16	415·061	Rosenthal Surplus 2nd	September
Bunya View Thelma's Pride	W. D. Davis, Wambo	8,447·55	370 358	Bingleigh Royal	September

Senior, 3 Years (Standard 290 Lb.).					
Eachamvale Beauty	J. K. English, Malanda	10,740·78	428·01	Cedar Grove Commodore	June
Bantry Bonny	D. Sullivan, Rosevale, Pittsworth	9,782 91	363 041	Rosenthal Surplus 2nd	June
Valera Sheila 12th (246 days)	Sullivan Bros., Pittsworth	8,431·5	334 231	Alfa Vale Pride 2nd	June
College Rainbow 4th	Queensland Agricultural High School and College, Lawes	9,227·8	366·080	Alfa Vale Pride 3rd	July
Chelmer Lulu 3rd	H. F. Marquardt, Wondai	7,855·65	294·742	Chelmer Champions Renown	August
Sunnycrest Princess	A. Sokoll, Wondai	8,273·35	336·356	Glebe Wallace 2nd	September
Junior, 3 Years (Standard 270 Lb.).					
Sunny View Evelyn 13th	J. Phillips and Sons, Wondai	12,088·7	466 641	Sunny View Commodore	June
Boah Peak Ruby 6th	H. L. and C. I. Bruggemann, Kulpi	7,045·35	313·330	Fairvale Musketeer	June
Bileena Chance 6th	C. K. Roche, Wheatvale, *via* Warwick	8,174·35	282	Tara Governor	June
Alva Glen Sparkle	D. Birch, Memerambi	9,556·5	354·799	Alva Glen Lovely's Reward	July
Glen Idol Countess 4th	Estate P. Doherty, Gympie	8,359 4	343·190	Blacklands Count	July
Fairvale Fuschia 8th	K. Berghofer, Westbrook	7,707·06	329·437	Fairvale Reward	July
Alva Glen Lovely's Spot	D. Birch, Memerambi	8,072 3	317·657	Alva Glen Lovely's Reward	July
Beaury Flirt 7th	A. F. Campbell, Killarney	6,931	280·681	Carribee Aviator	July
Fairvale Jean 12th	K. Berghofer, Westbrook	7,201·59	275 511	Bingleigh's Jean's Monarch	July
Fairvale Laurel 3rd	H. L. and C. I. Bruggemann, Kulpi	6,882 75	298·126	Fairvale Reward	August
Valera Fairy 6th	D. Sullivan, Bantry	8,717·96	360·021	Alfa Vale Pride 2nd	September
Senior, 2 Years (Standard 250 Lb.).					
Fairvale Opal 4th	H. L. and C. I. Bruggemann, Kulpi	8,054·9	338·937	Bingleigh Jean's Monarch	June
Ardilea Velvet 2nd	Hinrichsen and Sons, Clifton	7,073·65	321·066	Newstead Reliance	June
Merrivale Pretty 6th	Estate W. Soley, Malanda	7,279·7	308·740	Alfa Vale Felix	June
Bileena Chance 7th	C. K. Roche, Wheatvale, *via* Warwick	7,960·2	295 531	Tara Governor	June
Ennismore Beauty	E. W. Jackson, Nobby	6,366·8	257 101	Navillus Prince Henry	June
Sunnyview Little Princess 8th	J. Phillips and Sons, Wondai	12,697·6	502·839	Sunnyview Commodore	July
Millievale Jeanette	A. H. Webster, Stockyard Creek, *via* Helidon	9,556	456·962	Fairvale Victor	July
Beaury Grace	A. Campbell, Killarney	8,065 3	332·749	Dulcamah Monash	July
Beaury Red Lily 22nd	A. Campbell, Killarney	6,986 3	298 382	Dulcamah Monash	July
Glen Idol Fairy 15th (256 days)	Estate P. Doherty, Gympie	7,495·25	288·281	Blacklands Count	July
Lynfield Pearl 2nd	D. Birch, Memerambi	7,700·8	281·167	Blacklands Spotlight	July
Merrivale May 13th	Estate W. Soley, Malanda	7,066	272·937	Alfa Vale Noel	July
Lynfield Model 6th	D. Birch, Memerambi	7,306 95	266·998	Blacklands Spotlight	July
Alfa Vale Star 15th (365 days)	W. H. Thompson, Nanango	11,941·75	525·096	Alfa Vale Stalin	August
Navillus Norma 2nd	T. W. Fowler, Felton	6,342 37	260·74	Alfa Vale Re Nell	August
Bantry Maiden	D. Sullivan, Bantry	7,952 86	339·658	Rosenthal Surplus 2nd	September
Yarranvale Twinkle	K. Berghofer, Athol	8,182·2	328 372	Sunnyview Landmark	September
Bunya View Thelma 11th	W. J. Horrocks, Maclagan	7,148·05	312 645	Trevor Hill Reflection 143rd	September
Barwin Irene 2nd	G. Meyers, Imbil	7,193·65	282 176	Blacklands Young Czar	September
Junior, 2 Years (Standard 230 Lb.).					
Alfa Vale Model 30th	W. H. Thompson, Nanango	8,524·65	366·272	Alfa Vale Paisley	June
Mountain Camp Miss Thelma	Madge Bros., Southbrook	7,468·75	282·327	Newstead Bell Boy	June
Sunny View National Lady 2nd	J. Phillips and Sons, Wondai	12,520·80	489·748	Sunny View Kitchener	July
Bunya View Thelma 13th	W. D. Davis, Wambo	7,671 85	348 017	Trevor Hill Progress	July
Bunya View Thelma 14th	W. D. Davis, Wambo	7,370 75	305·785	Trevor Hill Progress	July
Rhodesview Nancy 75th	V. R. Nugent, Murgon	7,080·7	289·551	Fairvale Major	July
College Thorn 7th	Queensland Agricultural High School and College, Lawes	6,737·4	280·481	Alfa Vale Pride 3rd	July

Production Recording—*continued.*

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.	Month Compiled.
		Lb.	Lb.		
AUSTRALIAN ILLAWARRA SHORTHORN.					
JUNIOR, 2 YEARS (STANDARD 230 LB.)—*continued.*					
Mount Camp Miss Thelma 3rd	Madge Bros., Southbrook	6,564·22	252·184	Newstead Bell Boy	July
Faimoye Butterfly 2nd	C. K. Roche, Wheatvale	6,239·35	251·127	Sunbridge Regent	July
Bingleigh Molly 18th	J. C. Meier, Mount Mort	8,007·1	343·903	Blacklands Emblem	August
Valera Una 7th	Sullivan Bros., Pittsworth	7,790 43	304·206	Alfa Vale Pride 2nd	August
Cloverdale Doreen 3rd	Mrs. A. E. Powell, Chinchilla	6,342·35	250·08	Haroldale Barrister	August
Wenlock Redwing	H. G. Watson, Killarney	6,011·9	234·850	Alfa Vale Reaper	August
Ardilea Cherry 2nd	W. Hinrichsen and Sons, Clifton	7,657·55	327·874	Newstead Reliance	September
Arolla Beauty 13th	J. Crookey, Allora	7,669·3	315·615	Fairthorn Rainbow's Prince	September
Bunya View Duchess 6th	W. D. Davis, Wambo	7,633·3	308·138	Trevor Hill Progress	September
Yarranvale Gloria	K. Berghofer, Athol	6,835·65	298·330	Sunnyview Royal National	September
Yarranvale Royal Kitty	K. Berghofer, Athol	6,775·35	283·399	Sunnyview Royal National	September
Rhodesview Flossie	K. Berghofer, Athol	6403·8	257·599	Rhodesview Royal Lad 2nd	September
Grahamville Sapphire	W. J. Horrocks, Maclagan	6,478·2	242·295	Whitepark Ronald	September
Springlea Pretty Jean 3rd	J. E. Heath, Murgon	6,377·9	241·697	Alne Bank Wisdom	September
Bunya View Thelma 16th	A. C. Marquardt, Mondure	6,250·35	238·064	Trevor Hill Progress	September
Arolla Beauty 12th	J. Crookey, Allora	6,271·3	237·23	Fairthorn Rainbow's Prince	September
JERSEY.					
MATURE COW (STANDARD 350 LB.).					
Westwood Fairy Queen	F. Porter, Cambroon	8,846·6	499·586	Hunstrete Emperor's Volunteer (imp.)	June
Gem Lula	W. Bishop, Kenmore	9,088·35	484·031	Bulby Oxford Gamboge	June
Upwell Francis Fawn	B. T. Seymour, Upwell, Kapaldo	8,433·38	476·414	Upwell Noble Pioneer	June
Brookland Choice Rose	W. S. Conochie, Sherwood	8,275·65	452·638	Brooklands Choice Peer	June
Trecarne Chimes 5th	T. Petherick, Lockyer	8,022·2	447·06	Jerseylea Golden Duke	June
Glenrandle Fairette	P. Kerlin, Killarney	7,281·7	442·623	Bellgarth Stylish	June
Upwell Grey Guest	B. T. Seymour, Upwell, Kapaldo	7,685·75	422·862	Lindley Prince	June
Upwell Centum	B. T. Seymour, Kapaldo	7,621·75	420·379	Lindley Prince	June
Kathleigh Coronation	R. J. Crawford and Sons, Inverlaw	7,596·6	409·515	Banyule Senior	June
Glenrandle Hazeldale	P. Kerlin, Killarney	6,657·4	401·911	Bellgarth Stylish	June
Gem Mavis (236 days)	W. Bishop, Kenmore	7,997·15	389·189	Calton Lothean	June
Kathleigh Mist	R. J. Crawford and Sons, Inverlaw	6,850·05	388·03	Retford King's Thorn	June
Trecarne Jersey Hope	T. Petherick, Lockyer	6,536·05	368·685	Trecarne Some Duke	June
Trecarne Daffodil 2nd	W. P. Harmer, Golden View, Palen Creek	6,913·51	360·103	Brampton Daffodil's Peer	June
Glenview Moonlight	F. Z. Eager, Petrie	8,042·05	354·3	Trinity Governor's Hope	June
Trecarne Some Eileen	T. Petherick, Lockyer	6,934·95	353·822	Trecarne Some Duke	June
Westwood Heather	F. Porter, Cambroon, *via* Maleny	7,803·7	477·624	Westwood Palatines Volunteer	July
Kathleigh Mischief	R. J. Crawford and Sons, Inverlaw	6,582·5	465·805	Oxford Daffodil's Victor	July
Sunnyglen Mayflower	J. McCarthy, Budgee, *via* Greenmount	8,868·35	458·438	Ivy Bank Marquis	July
Kathleigh Mist (amended)	R. J. Crawford and Sons, Inverlaw	6,995·65	414·896	Retford King's Thorn	July
Boree Daffodil	W. and C. Tudor, Branch Creek	8,597·93	413·657	Maurfield Larkspur's Gift	July

Romsey Blossom	J. Wilton, Killarney	7,148·3	385·003	Oxford Dainty Peer	July
Boree Belle	W. and C. Tudor, Branch Creek	7,764·22	380·222	Maurfield Larkspur's Gift	July
Englebourne Gem	M. May, Hermitage, *via* Warwick	7,452·65	371·948	Oxford Rosina's Bert	July
Tecoma Brown Bird	A. Semgreen, Coolabunia	6,785·9	370·35	Oxford Asteroid	July
Trecarne Attractive	V. Granger, Nerang	6,776·9	367·254	Jerseylea Golden Duke	July
Boree Countess	W. and C. E. Tudor, Gayndah	9,030·2	453·081	Maurfield Larkspur's Gift	August
Westbrook Sylvia 16th	V. Dunstan, Wolvi	8,579·4	429·508	Mornmoot Clementines Valour	August
Boree Cute Lily	W. and C. E. Tudor, Gayndah	8,512·34	419·677	Trinity Cute Commodore	August
Windsor Princess Dinah	H. G. Johnson, Beaudesert	8,612·5	402·876	Bobs of Wingate	August
Palm Ridges Sylvina	H. Sigley, Jaggan	10,022·9	588·457	Overlook Financier	September
Romsey Joyful Maid	J. Wilton, Killarney	6,632	358·311	Oxford Dainty Peer	September
Lawnview Belle	V. Dunstan, Wolvi	6,583·2	352·382	Oxford Buttercups Peer	September
	SENIOR, 4 YEARS (STANDARD 330 LB.).				
Brookland Merry Primula	W. S. Conochie, Sherwood	8,210·9	495·352	Bulby Maria's Keepsake	June
Myrtledale Depants	H. Sigley, Jaggan	7,836·95	464·974	Oxford Remus Count	June
Carnation Miss	O. W. Spresser, Ipswich	6,255·05	350·691	Avondale Barleycorn's Golden Escort	June
Brooklands Cream Flake	W. Conochie, Sherwood	6,427·95	428·428	Englorie Cunning Victor	July
Austral Park Coronation Cowslip	A. Semgreen, Coolabunia	7,409·4	409·036	Austral Park Coronation Oxford	July
Westbrook Tulip 136th	Farm Home for Boys, Westbrook	6,859·6	347·524	Mornmoot Clementine's Valour	July
Boree Cute Christmas	W. and C. E. Tudor, Gayndah	8,628·54	414·419	Trinity Cute Commodore	August
Nairfale Princess Beth	R. G. Browne, Yangan	6,823·2	333·833	Nairfale Noble Count	August
Inverlaw Dainty Model	R. J. Crawford and Sons, Kingaroy	6,925·6	388·845	Oxford Royal Lad	September
Grasmere Majestic Samaritaine	M. May, Hermitage	6.071	352·882	Navua Victorious Samaritan	September
	JUNIOR, 4 YEARS (STANDARD 310 LB.).				
Brookland Merry Jingle Belle	W. S. Conochie, Sherwood	8,823·15	497·07	Bulby Maria's Keepsake	June
Romsey Stylish Hope	J. Wilton, Killarney	7,186·4	364·596	Bellgarth Stylish	July
Westbrook Golden Bread 8th	Farm Home for Boys, Westbrook	7,183·85	323·226	Mornmoot Clementine's Valour	July
Glenrandle Lucy	D. Kerlin, Killarney	7,215·7	365·008	Bellgarth Glory King	August
Boree Cute Lilac	W. and C. E. Tudor, Gayndah	6,951·4	356·602	Trinity Cute Commodore	August
Trinity Cute Dream	D. R. Hutton, Cunningham	6,445·2	332·112	Samares Cute Prince 3rd	September
	SENIOR, 3 YEARS (STANDARD 290 LB.).				
Trecarne Pealing 4th	C. Huey, Ashview, Sabine	6,281 9	328·960	Trecarne Some Duke	June
Brooklands Angel Cake	W. S. Conochie, Sherwood	6,279·55	390·892	Bulby Maria's Keepsake	July
Riveria Ivy Pride	J. Sigley, Millaa Millaa	6,643·4	363·156	Navua Designing Star	July
Boree Gift's Queen	W. and C. E. Tudor, Gayndah	8,098 6	404·359	Maurfield Larkspur's Gift	August
Lermont Silver Bell 2nd	J. J. Ahern, Conondale	6,252·4	390·166	Selsey Samares Hallmark	August
Boree Bravo's Model	W. and C. E. Tudor, Gayndah	7,767·29	380·55	Boree Bravo	August
Boree Gift's Marvel	W. and C. E. Tudor, Gayndah	7,985·55	359·412	Maurfield Larkspur's Gift	August
Westbrook Starbright 8th	Farm Home for Boys, Westbrook	6.420·55	320·106	Selsey Royal Standard	August
Gem Ingrid	W. Bishop, Kenmore	7,781 58	420·707	Bulby Oxford Gamboge	September
	JUNIOR 3 YEARS (STANDARD 270 LB).				
Nairfale Likeness	R. J. Browne, Yangan	8,684·8	423·422	Nairfale Golden Recorder	June
Nairfale Lena	R. J. Browne, Yangan	7,382·2	383·699	Nairfale Golden Reality	June
Westbrook Starbright 7th	Farm Home for Boys, Westbrook	6,393·2	346·384	Selsey Royal Standard	June
Englebourne Nixey	M. May, Hermitage, *via* Warwick	6,826·2	339·725	Oxford Floss' Remus	June
Pinegrove Victory	J. W. Evans, Rosewood	5,876·6	311·403	Roseview Peer	June
Westbrook Starbright 9th	Farm Home for Boys, Westbrook	6,752 95	308·091	Mornmoot Clementine's Valour	June
Nairfale Mayday	R. J. Browne, Yangan	5,563 9	279·657	Nairfale Count's Paymaster	June
Trecarne Bright Tot	T. Petherick, Lockyer	5,041·2	279·488	Trecarne Ruler 2nd	June
Inverlaw Governess	R. J. Crawford and Sons, Inverlaw	7,304·1	403·56	Trinity Governor's Hope	July

PRODUCTION RECORDING—*continued.*

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.	Month Compiled.
		Lb.	Lb.		
JERSEY.					
JERSEY, 3 YEARS (STANDARD 270 LB.)—*continued.*					
Brooklands Merry Prudence	W. Conochie, Sherwood	6,670·05	394·801	Bulby Maria's Keepsake	July
Ashview Hope	C. Huey, Ashview, Sabine	5,437·3	287·359	Trecarne Victor 4th	July
Lermont Locketette 3rd	J. Schull and Sons, Oakey	5,050·05	278·295	Trinity Noble Effort	July
Boree Cute Buttercup	W. and C. E. Tudor, Gayndah	8,246·96	393·549	Trinity Cute Commodore	August
Boree Cute Charm	W. and C. E. Tudor, Gayndah	8.079·18	373·868	Trinity Cute Commodore	August
Burnlea Gracious	A. E. Trigger, Didcot	5,843·25	283·666	Burnlea Aviator 4th	August
Mayfair Countess	J. W. Carpenter, Helidon	5,633·05	361·568	Lermont Double Volunteer	September
Fauvic Fidget	W. J. Blair, Cooroy	7,162·4	323·214	Brooklands Big Ben	September
Lermont Bellette 3rd	J. Schull and Sons, Oakey	4,834·85	310·102	Lermont Ambassador	September
SENIOR, 2 YEARS (STANDARD 250 LB.).					
Carnation Hope's Hazelette	O. W. Spresser, Ipswich	7,603	389·675	Bellgarth Glory King	June
Boree Cute Melody	W. and C. E. Tudor, Branch Creek	7,218·56	346·926	Trinity Cute Commodore	June
Nairfale Trinket	R. J. Browne, Yangan	6.113·6	333·446	Nairfale Count's Prominence	June
Trecarne Dairy Queen 3rd	T. Petherick, Lockyer	6,550·7	310·8	Trecarne Some Duke	June
Kinross Princess Rene	H. R. Randall, Woowoonga	5,486·50	308·774	Trinity Royal Prince	June
Lermont Lynette 3rd	J. McCarthy, Glen Erin, Greenmount	5,039·9	297·518	Trinity Noble Effort	June
Linden Grove Design's Lily	H. Cochrane, Kin Kin	5,257·5	288·464	Navua Hamlet's Designer	June
Windsor Princess Leda	L. E. Harmer, Beaudesert	5,440·8	274·121	Bobs of Wingate	June
Inverlaw Mauve Daisy	R. J. Crawford and Sons, Inverlaw	5,254·5	254·903	Oxford Royal Lad	June
Brooklodge Bright	T. Ahern, Conondale	6,438·7	374·792	Trecarne Some Victor	July
Lawnview Helen	V. Dunstan, Wolvi, Kin Kin	6,228·65	359·649	Oxford Maxie	July
Mayfair Bell 3rd	J. W. Carpenter, Flagstone Creek, *via* Helidon	5,190·3	302·874	Lermont Double Volunteer	July
Somersby Pride	H. R. Randall, Woowoonga	6,439·2	298·636	Trinity Dreaming Lad	July
Ashview Graceful	C. Huey, Ashview, Sabine	4,668·9	270·373	Trecarne Victor 4th	July
Ashview Connie	C. Huey, Ashview, Sabine	5,999·15	267·782	Trecarne Victor 4th	July
Nairfale Gentle	R. J. Browne, Yangan	5,375·3	263·054	Nairfale Golden Recorder	July
Wyreene Mermaid	J. A. Smith, 16 Mile Creek	4,485·6	254·361	Wyreene Boutilliere	July
Gem Norelle	W. Bishop, Kenmore	6,947·25	327·371	Gem Valour	August
Somersby Daffodil	H. R. Randall, Woowoonga	6,165·35	300·887	Trinity Dreaming Lad	August
Hocknell Volunteer Ginger Cake	L. E. Harmer, Beaudesert	5,546·1	269·431	Navua Sporting Volunteer	August
Gem Primrose 2nd	L. E. Harmer, Beaudesert	6,047·95	269·156	Gem Valour	August
Somersby Daisy	H. R. Randall, Woowoonga	6,202·45	257·298	Trinity Dreaming Lad	August
Somersby Glory	H. R. Randall, Woowoonga	5,982·75	251·205	Trinity Dreaming Lad	August
Burnlea Matilda	A. E. Trigger, Didcot	5,815·25	320 117	Woodside Rochette's Monarch	September
Kenilworth Diadem	I. J. L. Evans, Cooroy	6,008·7	304·690	Rosevale War Bond	September
Inverlaw Miss Patty	R. J. Crawford and Sons, Kingaroy	4,447·5	283·732	Inverlaw Councillor	September
Sunny Glen Empress 4th	J. McCarthy, Budgee	5,004·25	280 914	Ashfield Quality Boy	September
Inverlaw Royal Darling	R. J. Crawford and Sons. Kingaroy	4,860·25	277·059	Oxford Royal Lad	September
Burnlea Heather	A. E. Trigger, Didcot	4,966·45	274·715	Woodside Rochette's Monarch	September

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Bellgarth Bluebird	P. Kerlin, Killarney	5,932·5	332·226	Bellgarth Victory	June
Minidong Maid	R. J. Browne, Yangan	6,240·7	327·151	Balwyn Fancy's Baron	June
Trecarne Dairy Queen	T. Petherick, Lockyer	5,525 3	320·228	Trecarne Some Duke	June
Nairfale Idols Delight	R. J. Browne, Yangan	5,710	309·745	Nairfale Golden Record	June
Myrtledale Sea Shore	H. Sigley, Jaggan	5,128·25	297·591	Oxford Remus Count	June
Oxford Comtesse	E. Burton and Sons, Oxford, Wanora	5,531	295·547	Oxford King Peter	June
Brooklands Regal Laurel Leaf	W. S. Conochie, Sherwood	5,160·75	291 25	Brooklands Regalia	June
Inverlaw Birdie	R. J. Crawford and Sons, Inverlaw, Inverlaw	5,834	290·236	Oxford Royal Lad	June
Rosehill Peace	G. V. Tilley, Rosalie, Beaudesert	5,060·55	279·195	Carnation Bangle's Victory	June
Fauvic Jollity	H. Cochrane, Fauvic, Kin Kin	4,879·25	274·881	Fauvic Joker	June
Tecoma Flora	A. Semgreen, Coolabunia	5,272·8	266·669	Glenview Royal Chief	June
Oxford Lurline	E. Burton and Sons, Oxford, Wanora	5,496·45	263·348	Glenside Golden Victory	June
Inverlaw Lucy's Locket	R. J. Crawford and Sons, Inverlaw	4,118·4	256·121	Oxford Royal Lad	June
Carnation Bluebell	O. W. Spresser, Ipswich	4,694·45	254·185	Oxford Fawn's Victor	June
Myrtledale Silver Links	C. J. McKell, Jaggan	4,697·85	252·343	Palm Ridges Golden Victory	June
Carnation Maiden	O. W. Spresser, Ipswich	4,482 25	249·441	Rosslyn Royal Trigger	June
Trinity National Victory	N. C. Webb, Hocknell, Beaudesert	5,922 3	238·101	Trinity National Victory	June
Rosslyn Beauty's Keepsake	C. C. Courtman, Corinda	8,013·75	397·186	Bulby Maria's Keepsake	July
Trinity Golden Duchess 3rd	J. J. Ahern, Conondale	5,614·5	361·154	Samares Cute Prince	July
Windsor Royal Beatrice	H. G. Johnson, Gleneagle	6,279·1	311·712	Brookland Merry Monarch	July
Oxford Regal Maid	E. Burton and Sons, Wanora	5,627·85	300 313	Brookland Regalia	July
Connemara Royal Chimes	J. Ahern, Conondale	4,308·25	291·405	Trecarne Golden King 2nd	July
Lermont Starlight	J. Schull and Sons, Oakey	4,967·95	240·946	Trinity Graceful Duke	July
Oxford Eileen	F. C. Leschke, Delrose, Wanora	4,710·35	233·727	Oxford King Peter	July
Minidong Maid (365 days)	R. J. Browne, Yangan	7,489·7	405·884	Balwyn Fancy's Baron	August
Boree Cute Crystal	W. and C. E. Tudor, Gayndah	6,898·56	342·074	Trinity Cute Commodore	August
Somersby Violet	H. R. Randall, Woowoonga	6,186·5	287·853	Trinity Dreaming Lad	August
Brooklodge Sparkle	J. J. Ahern, Conondale	4,978 35	278·781	Trinity Mighty Prince	August
Oxford Falora	L. Oxenford, Oxenford	5,024·45	272·485	Glenside Golden Victory	August
Parkview Pearl	H. T. W. Barker, Oakey	4,367·25	260 143	Westbrook Valour 7th	August
Oxford Marcelle	L. Oxenford, Oxenford	4,740·05	257·279	Oxford King Peter	August
Tecoma Leah	A. Semgreen, Coolabunia	4,887·4	254·958	Glenview Royal Chief	August
Hocknell Bravo Sybil	N. C. Webb, Beaudesert	4,734·3	242·942	Navua Victoire Lad	August
Kingsford Anna	V. Dunstan, Wolvi	5,108·45	241·053	Oxford Topher	August
Brooklodge Bliss (252 days)	J. J. Ahern, Conondale	6,434·3	330·357	Trinity Mighty Prince	September
Oxford Brown Maid	J. Wilton, Killarney	5,421·6	280 603	Oxford King Peter	September
Oxford Regal Carolyn	V. Granger, Nerang	4,910·5	277·654	Brooklands Regalia	September
Fauvic Glow Worm	W. J. Blair, Cooroy	4,836·25	276 696	Fauvic Comet	September
Inverlaw Moonbeam	H. Sigley, Jaggan	4,253·55	241 691	Inverlaw Royal George	September
Parkview Velvet Tottie	H. W. Barker, Oakey	5,173	236·862	Westbrook Valour 7th	September

GUERNSEY.

MATURE COW (STANDARD 350 LB.).

Adaville Carol	Wm. Cooke, Witta, *via* Maleny	7,689·75	395·7	Linwood Clinker	June
Laureldale Carrie	Wm. Cooke, Witta, *via* Maleny	7,079 8	385·156	Laureldale President	June
Laureldale Poppy (187 days)	W. A. K. Cooke, Witta	6,920·55	366·988	Laureldale Peaceboy	June
Laureldale Veronica	W. Cooke, Witta	10,386·2	514 878	Laureldale President	July
Laureldale Velvet	W. Cooke, Witta	9,361·25	466·761	Laureldale Prairie Prince	July
Laureldale Clare	W. A. K. Cooke, Witta	6,734·95	403·021	Minna Murra Topsy's Sequel	August
Fernhill Golden Laurel	D. C. Johnston, Logan Village	7,708·8	350 089	Cooroora View Pilgrim	September

PRODUCTION RECORDING—*continued.*

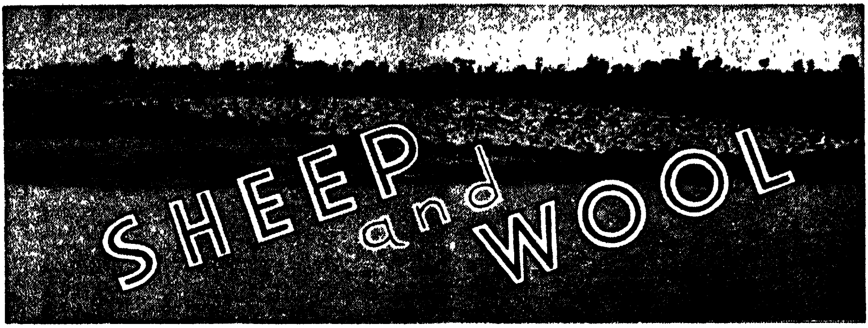
Animal.	Owner.	Milk Production.	Butter Fat.	Sire.	Month Compiled.
		Lb.	Lb.		
GUERNSEY—*continued.*					
Senior, 4 Years (Standard 330 Lb.).					
Adaville Sweetness	Wm. Cooke, Witta	6,269·8	354·186	Laureldale Pluto	July
Junior, 4 Years (Standard 310 Lb.)					
Laureldale Liddy (222 days)	W. Cooke, Witta	9,473·15	462·201	Minna Murra Topsy's Sequel 2nd	June
Junior, 3 Years (Standard 270 Lb.).					
Tattenbar Fay	W. A. K. Cooke, Witta	8,029·9	399·96	Laureldale Trump	August
Senior, 2 Years (Standard 250 Lb.).					
Adaville Charm (251 days)	D. C. Johnston, Logan Village	5,928·15	285·133	Laureldale Pluto	July
Adavale Sweetty	G. Miller, Chambers Flat	5,889·45	271·742	Linwood Guess	July
Junior, 2 Years (Standard 230 Lb.).					
Laureldale Pleasant	W. A. K. Cooke, Witta	5,068·43	280·04	Minna Murra Topsy's Sequel	August
AYRSHIRE.					
Junior, 2 Years (Standard 230 Lb.).					
Leafmore Miss Bell 2nd	J. P. Ruhle, Motley, *via* Oakey	6,399·8	279·589	Leafmore Jerrard	July

WHY CREAM TESTS VARY.

The following equations should be substituted for those given on pages 153 and 154 of the September issue:—

Diagram 2, Low Speed—Cream Test = 18%.

Diagram 3, Small Inflow—Cream Test = $\frac{11{\cdot}2}{20} \times 100 = 56\%$.



The Tail Strip Operation.

G. R. MOULE, Officer in Charge, Sheep and Wool Branch.

THE widespread application of the Mules Operation, which is a very effective protection against crutch strike of sheep, has focussed attention on strike originating on other parts of the sheep's breech, such as the tail.

It has been clearly shown that the length at which the tail is cut has an important bearing on the subsequent predisposition of the sheep to strike originating in the crutch as well as on the tail. For this reason it has been suggested that the lamb's tail should be cut at about the level of the tip of the vulva.

Other factors, however, may influence the likelihood of strike originating on the tail. These include the shape of the tail, the length of the wool on the tail and the way in which the tail has been cut. It is generally accepted that in tailing lambs it is essential to turn the bare skin from the undersurface of the tail back over the severed stump. This obviates the danger resulting from wool, which may grow on the very tip of the tail, becoming wet with urine and attractive to flies.

Similarly it has been found that it is possible, by performing a simple operation referred to as tail stripping, to draw the bare skin from the undersurface of the tail around its sides. This is done by removing a strip of the wool-bearing skin from the back of the tail. When healing is completed the sheep has a narrow fringe of wool down the centre line of the back of the tail and the risk of soiling of the wool growing on this appendage is thereby removed.

Field experience has shown that this operation will increase the protection against strike originating on the tail, irrespective of its length. Accordingly its use is recommended where woolgrowers feel that it is inadvisable to cut the lamb's tail long enough to be level with the tip of the vulva and/or where there is a high incidence of tail strike.

Performing the Operation.

The tail strip operation can be performed before the tails are cut at marking time, or in conjunction with the Mules Operation at or about weaning time, when it is particularly easy to perform if the sheep are fat. The main advantages of doing the operation at marking time are (i.) it may be easier to hold the tail; and (ii.) the cuts can be carried right down past the level at which the tail is to be cut.

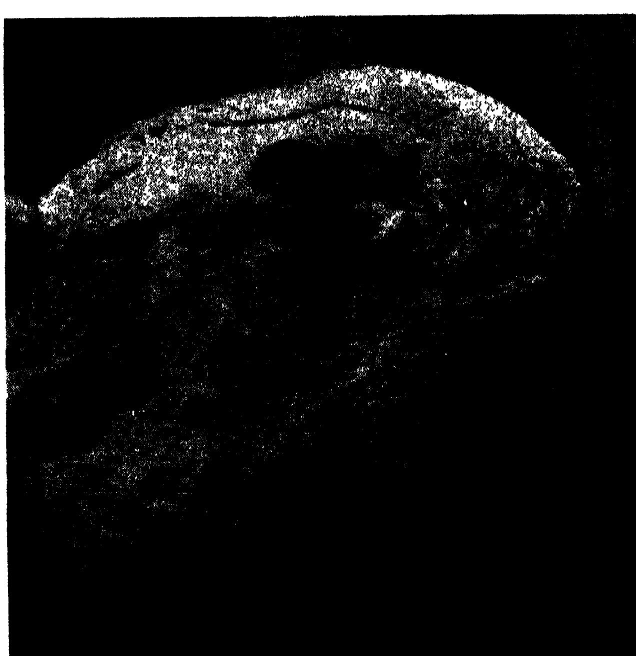


Plate 70.

The Tail Strip Operation Performed on a Weaner.

Plate 71.

Showing the Fringes of Wool left on the Tail.

If the operation is performed on older sheep, such as weaners, it is essential to carry the cut down to the very end of the tail so that the wool-growing skin is removed right to the tip, as is shown in Plate 70.

The operation is performed with a sharp pair of 5-inch dagging shears similar to those used for the Mules Operation. The "reverse" grip—that is, back of the hand to the sheep—is used and the cut should commence well above the base of the tail with a sharp "V." This is most easily achieved by picking up the skin with the shears at the commencement of the cut. In treating lambs the cuts should go well down past the level at which the tail is to be severed (Plate 71).

Plate 72.

Showing the Length of the Cut on a Lamb.

As the cut is extended down the back of the tail its width is increased to leave a fringe of wool about $\frac{1}{4}$-inch–$\frac{3}{8}$-inch on each side (see Plate 72).

If the operation is being performed on weaners it is essential to do it at a time when the wool is short, such as immediately after shearing or crutching.

The usual precautions which are observed in undertaking the Mules Operation, such as keeping the instruments clean and avoiding carrying out the work when bush flies and/or blowflies are numerous, obviously apply.

ANIMAL HEALTH

Brucellosis (Contagious Abortion) in Cattle.

A. L. CLAY, Divisional Veterinary Officer.

DEFINITION AND CAUSE.

THE term "brucellosis" confuses many people. To add to the confusion many American writers refer to contagious abortion of cattle as "Bang's disease," a name derived from that of the man who discovered the cause of the disease in 1896. It is well, therefore, to know the derivation of the term brucellosis and why it is preferred to the older name, contagious abortion.

The term brucellosis comes from the name given to a group of micro-organisms of a rather special type, which cause disease in man, cattle, pigs and horses. The first man to discover one of these organisms was David Bruce. He made the discovery in 1887 when investigating a disease of human beings known as Malta or Mediterranean fever, and called the organism *Micrococcus melitensis*. Some 30 years later (in 1918) the relationship of this disease to contagious abortion of cattle was revealed. Since that time the organism causing Malta fever has been named *Brucella melitensis* in honour of the discoverer, and the organism which causes contagious abortion of cattle, previously known as *Bacillus abortus*, has been renamed *Brucella abortus*.

Brucellosis simply means "disease due to *Brucella* organisms." It is a specific disease which can occur only in the presence of these organisms. The term can be used to describe the disease whether it occurs in man, cattle, pigs, or horses, and when it is used no room is left for confusion because it can mean only one thing, that is, disease due to *Brucella* organisms. No other term has this advantage.

Additional reasons why the term brucellosis is to be preferred are as follows:—

(1) There is more than one kind of abortion in cattle which is of a contagious nature, so that when different people speak of "contagious abortion" they may be speaking of quite different diseases.

(2) Some cows affected with brucellosis do not abort at all; and many, though they abort once, carry subsequent calves to full time.

(3) There are other important consequences of brucellosis in cattle quite apart from abortion. Such are sterility, difficulty in rearing calves, and lowered production.

ECONOMIC IMPORTANCE.

Losses caused by brucellosis in cattle are often very considerable, so much so that individual farmers have sometimes been virtually forced to give up dairying because of the ravages of the disease. No reliable estimate is available of the loss in the aggregate to the dairy industry in Queensland or the other Australian States, but there can be no doubt that it is huge.

The losses in affected herds are largely the result of lowered milk production. It is universally accepted that production in an infected herd compares unfavourably with that in a "free" herd, all other things being equal. The lower milk production in infected herds is due to calvings taking place before full term, delay or even complete failure of cows to prove in calf, and the prolonged ill-health which is sometimes the aftermath of an abortion, especially if accompanied by retention of the afterbirth.

A very large number of cows is believed to be disposed of each year as "tinners" because of sterility consequent upon brucellosis.

The serious position created in stud herds by the birth of dead calves or of weak calves which are difficult to rear is obvious.

Finally, it is necessary to note that the presence of brucellosis may lead to quarantine restrictions, direct or indirect, on farms, districts, or even whole States. No cattle can be imported into Australia unless they are free from brucellosis. In Queensland, because of the prevalence of the disease, quarantine is imposed only in exceptional circumstances.

DISTRIBUTION AND INCIDENCE.

Brucellosis is world wide in its distribution. In Queensland it occurs in all the recognized dairying districts and for the most part must be considered as prevalent, perhaps especially so on the Darling Downs.

The percentage of infected animals found in herds in which the disease occurs ranges up to 60 and even 80, excluding calves.

Though a figure cannot be stated with anything like certainty, it is probable that upwards of 10 per cent. of all dairy cows in a district like the Darling Downs are at any one time affected with brucellosis.

The disease occurs in beef cattle but is not of comparable importance to the disease in dairy cattle. There are exceptions, especially in stud beef herds, where the degree of contact between the animals approaches more closely that found in dairy herds.

HOW COWS BECOME INFECTED.

For the most part brucellosis is brought into a herd with purchased cattle. Buying replacement cattle at a saleyard is attended with the risk of purchasing infected animals; it should be avoided if at all possible. There is also some risk when making purchases at "clearing sales" as it may perhaps be that the "clearing out" process is in some measure the consequence of the ravages of brucellosis.

Straying cattle may introduce the disease. Sending cattle to other farms (as for service) or taking them to Shows and then returning to the home farm may introduce the disease. Dogs, foxes, and perhaps crows may act as mechanical conveyors of infective material.

Drainage from adjacent infected farms may be responsible for introducing infection.

Brucella microbes are frequently present in the milk of affected cows. This infection may occasionally be transmitted on the hands of milkers, especially to cows with abrasions on the teats.

Experimentally, cows have been infected through the eye and the skin, but these are not considered common ways of infection under natural conditions.

There can be no question, however, that introducing and maintaining infected animals in a herd is by far the most important source of infection.

Pasture Contamination.

Whether they abort or carry their calves to full term, infected cows discharge from the breeding passage, for some weeks, large numbers of micro-organisms, which contaminate the hindquarters, pasture, water supplies, &c. Since most cows are infected by way of the mouth, contaminated pasture represents the most common source of infection.

The droppings from calves fed on infected milk may contaminate pastures, the microbes passing right through the calves' digestive tracts without being destroyed.

The survival of *Brucella* microbes on pasture is obviously a matter of great importance. Survival is longer in winter than in summer, and at any time of the year is longer in a situation which is protected from the direct rays of the sun.

The longest survival time noted under experimental conditions in Australia has been between 90 and 100 days. The survival time was consistently longer for microbes in the afterbirth itself as compared with microbes in discharges.

Pastures are probably quite safe three months after the removal of infected stock in summer and four months in winter.

Infection from the Bull.

The part played by the bull in infecting cows has been the subject of much misunderstanding. It was originally thought that service by infected bulls was a common source of infection. Later investigations suggested very strongly that infected bulls did not transmit the disease in the act of service except perhaps in rare instances. Quite recently, however, Danish veterinarians have shown that at any rate some bulls can transmit the disease with some degree of regularity during service, more especially when their semen is used for artificial insemination.

Though many infected bulls fail to transmit brucellosis by service it has now to be recognized that some may do so and the use of such bulls may cause rapid spread of infection in a herd.

Infection from Other Animals.

Brucellosis of pigs requires some consideration in relation to mode of infection of cattle. The causal microbe in swine is known as *Brucella suis,* and though similar to *Brucella abortus* is not quite the same thing. Cattle are susceptible to *Brucella suis* but infection is not common.

Fistulous withers in horses is sometimes due to *Brucella abortus*, or at all events the latter is present in the lesion. Horses with fistulous withers, especially if the lesion is discharging, are a potential danger to cattle.

SUSCEPTIBILITY OF DIFFERENT CLASSES OF CATTLE.

Some cows are much more susceptible to infection than others. In herds which have been blood-tested annually without removing reactors it has been noted that some animals remain negative to the test year after year despite the presence of many infected animals in the herd. These negative animals have certainly been exposed to infection on numerous occasions but the infective agent does not become established in the cow. Such cows have a natural resistance to brucellosis. They constitute a varying percentage of the cows in different herds—usually 20 to 30 per cent. but sometimes considerably less.

Calves are rather a special case. Nearly all calves have a high resistance to infection, at all events until six months old. This is so whether the infection is natural or artificial, for example, by inoculation with living vaccines. From six months onwards the resistance decreases but is often evident even at 12 months of age. Resistance in calves is considered by some authorities to be connected with the lack of development of the sexual organs. Once these attain full development—that is, when the calf becomes capable of breeding—then susceptibility to infection increases very markedly.

The in-calf cow is more susceptible to infection, or at all events to the ill-effects of infection, than the not-in-calf cow. Abortion is much more likely to follow if infection occurs during pregnancy, except that if infection occurs after the seventh month there may not always be sufficient time for the *Brucella* microbes to cause enough damage in the uterus to bring on an abortion. Infection taking place while a cow is "empty," or during the very early stages of pregnancy, is quite often followed by an apparently normal calving.

It will be seen that infection with *Brucella* microbes need not necessarily result in the calf being aborted.

SYMPTOMS.

The most obvious symptom is the failure of cows to carry their calves to full term, the calf being aborted usually at about the fifth month of pregnancy, though sometimes earlier. However, calves may be carried to full or nearly full term and be born dead, or if born alive be underweight. Further, in these cases there is often retention of the placenta (that is, failure of the cows to get rid of the afterbirth).

Sterility is a matter of very real concern in the great majority of heavily infected herds and is due to the abnormal uterus (womb) which prevents conception. Brucellosis would be less serious than it is if, following abortion, the uterus always returned to its normal healthy state and so allowed of another pregnancy being got under way. Unfortunately, such is often not the case, cows being left with a chronic inflammation of the womb. The condition is very difficult to treat because the organ is so inaccessible.

Calves born of affected dams are prone to scours and pneumonia.

A less frequent indication of the disease is the presence of swellings on various parts of the body. Sometimes these swellings are associated with joints, the knee joint being the one most commonly affected. On the other hand, the swellings may have no association with a joint; in these cases they occur commonly on the sides of the neck, on the withers, in the flank or over the hip. The swellings in the neck region may be very large and contain a gallon or more of fluid.

In the bull there may be swelling of one (usually) or both (sometimes) testicles, but such is not necessarily the case.

None of the symptoms described can be regarded as enabling certain diagnosis of brucellosis. This can be done only after use has been made of the "blood test."

As has already been noted, once cows abort as the result of brucellosis they will in most cases carry subsequent calves to full term, always provided they remain capable of breeding. This is of great importance in assessing the results obtained from the administration of "cures" or "remedies."

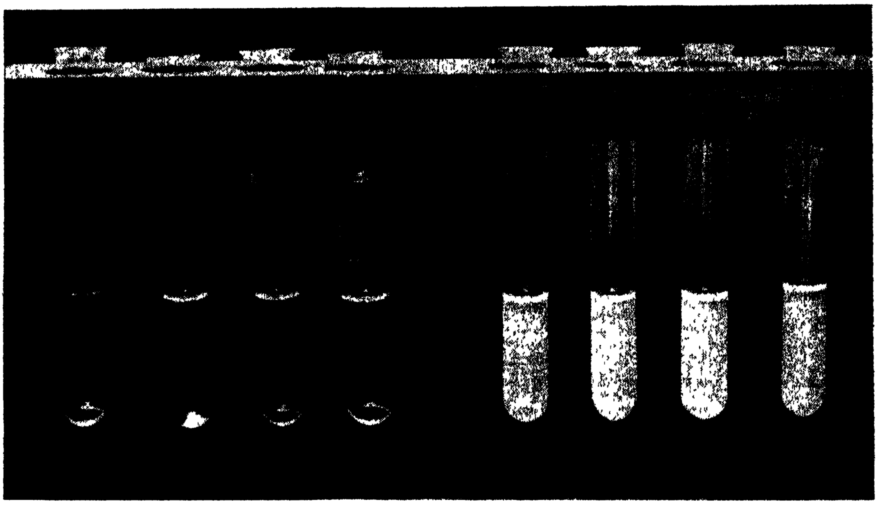


Plate 73.

AGGLUTINATION TESTS.—Left, positive tests; right, negative tests.

POST-MORTEM CHANGES.

The disease does not cause death of the dam, but if the animal is killed and examined the only sign found is an inflammation of the uterus. Even this is not constant.

The afterbirth which is shed following the delivery of a dead calf usually (but not always) shows some changes from the normal. The cotyledons are a dirty-yellow colour and gelatinous in consistency. The membranes as a whole may be infiltrated with a yellow gelatinous material. Most suggestive of all is the presence of areas in the membranes which can be described as leathery in texture.

DIAGNOSIS BY BLOOD TESTING.

One can suspect the presence of brucellosis in a herd but there is only one way of making certain, and that is to submit blood samples from suspected cattle to a laboratory for test. The test is correctly referred to as an agglutination test, but is commonly spoken of as a "blood test." The test is carried out on the serum—that is, the clear yellowish fluid which separates out from blood after it has clotted. The serum is mixed with a suspension of *Brucella* microbes in a series of small glass tubes. The mixture which results is cloudy in appearance. The tubes are then placed in an incubator for 24–48 hours, after which time the test is read (Plate 73).

In a positive test the mixture in the tube becomes quite clear and the microbes which were responsible for the cloudy appearance settle on the bottom of the tube as a distinct deposit or sediment. In a negative test the cloudy appearance remains and no deposit forms at the bottom of the tube.

Plate 74.

Collecting a Blood Sample.—Note tourniquet or bleeding strap applied so as to cause distension of the jugular vein. The needle is inserted into the vein with a quick thrust; then, the sample having been collected, the tourniquet is loosened *before* the needle is withdrawn from the vein.

The test works by reason of the presence of certain "antibody" substances in the blood stream of infected animals. When these substances in the blood serum come into contact with the *Brucella* microbes in the tube, they cause them to agglutinate (hence the name agglutination test) or clump together. Having done so they are no longer capable of remaining suspended in the liquid, and sink to the bottom of the tube, leaving a clear fluid above.

The test is reliable to an extraordinarily high degree, but it is not infallible. A small percentage of infected cows will not react at the time of the act of abortion or of calving, whichever it may be. Some weeks later they will give a positive reaction.

Another disadvantage is the fact that the development of antibodies in the blood (consequent upon infection) is occasionally a very slow process. Before antibodies appear in such animals an eradication programme may be believed to have been completed and testing suspended temporarily. Such an animal may thus be undetected until it aborts and starts a fresh cycle of infection.

Taking Samples for Testing.

Blood samples for submission to test may be obtained from the ear, the tail or the jugular vein. The jugular vein is by far the most satisfactory (see Plate 74). A fairly stout hypodermic needle about 3 inches long is required and the use of a device known as a King bleeder to hold both the needle and the bottle into which the blood sample is drawn greatly facilitates the procedure.

The cow's head must be secured firmly to a rail or post. A strap or cord is then looped round the animal's neck and pulled taut. This results in the jugular vein becoming prominent, whereupon the needle is inserted with a quick thrust and the sample collected. The strap is then loosened and the needle withdrawn from the vein.

A sword-type bail is very useful for bleeding cattle and can be installed at the exit end of a crush.

GENERAL FARM PRECAUTIONS.

In the absence of an attempt to eradicate the disease altogether, there are certain general precautions which should be taken.

(1) Isolate all cows which abort or have premature calves, such isolation to continue until all traces of discharge have disappeared. During the isolation period (especially the early part) syringe out the cow with a reliable antiseptic solution to minimize the output of live *Brucella* microbes. "Dettol" and "Lysol" (1 fluid oz. to 1 gallon of lukewarm water) are examples of suitable fluids to use. About one quart should suffice for each cow unless the amount of discharge present is exceptionally large.

The person carrying out this work should wear gum boots and either remove them just prior to leaving the isolation paddock or else disinfect them thoroughly.

(2) Do not use a known infected bull if it can be avoided. Do not put cows mentioned in (1) to a non-infected bull for at least six weeks after they have aborted or (in later years) calved.

(3) Locate the foetus and the afterbirth (if not retained) and burn them and fire the grass in the immediate vicinity. If this is too much of a fire risk, then disinfect as efficiently as possible.

(4) Keep the tail and buttocks of all cows free from matted discharge. This material may be teeming with *Brucella* microbes.

(5) Watch cows carefully for signs of impending abortion with a view to getting them into isolation before the event takes place.

(6) Rear all herd replacements on the property; but if purchases must be made, then buy only from herds which are beyond reproach, or if your herd is already infected buy animals which have been vaccinated as calves.

(7) Unless special circumstances exist it is best to dispose of infected cattle in the late spring or early summer, for the reason that residual infection on pasture will die out quicker at that time of the year.

(8) Send to slaughter cows known to be infected and which fail to prove in calf after a reasonable period.

In the absence of precautions as outlined, a certain "balance" eventually comes about in an infected herd and a farmer perhaps comes to think that brucellosis is after all not a matter of any great account. Now, though it is well recognized that brucellosis is self-limiting, the disease leaves many cows sterile. The average number of services by the bull per live calf may rise as high as five, the calf crop itself may come down to 50 per cent. of the cows annually, production comes down and wastage through having to cull barren cows is heavy. In such herds the percentage of heifers which abort is often very high indeed; moreover, as the abortion takes place while the animals are still growing, the ill-effects are accentuated.

TEST-AND-SLAUGHTER METHOD OF CONTROL.

Test and slaughter is a method which has been an important means of controlling brucellosis for many years. Until comparatively recent times it was really the only worth-while method available.

The blood test enables the animals in a herd (as at the date of test) to be catalogued as infected, possibly infected, and not infected. They are referred to as positive, suspicious, and negative, respectively. Obviously, if all the infected animals—and to be on the safe side, the possibly infected ones also—are removed the remaining herd is composed exclusively of non-infected animals. However, the infection present on the pastures grazed by the infected cattle will remain for about three months and during that time some of the non-infected animals may become infected through grazing on those pastures. It must also be recognized that there may still be animals in the herd which though actually infected have not arrived at the stage where they react to the blood test. To counter this situation, what remains of the herd is retested at 30-day intervals until a "clean" test is obtained. After the second and each subsequent test the positive reactors are eliminated, but suspicious reactors are often held until the next test and, as it were, given another chance.

It is necessary to get two "clean" tests at an interval of not less than 90 days before a herd can be accepted as free from the disease. The number of tests which have to be applied before this requirement is met varies greatly and there is no way of forecasting it. The number of cattle which have to be liquidated also varies greatly; it is again difficult to forecast. The procedure meets with earlier success on some farms than others, but the reasons are not always apparent.

The cost of this method may be considerable and there are many farms on which it cannot be justified in the light of present-day knowledge. It does have attractive features if a man has two farms, on one of which he can run all the reactors (infected cattle) and on the other the "clean" (non-infected) cattle.

Having "freed" a herd from brucellosis it has often happened that the disease is re-introduced at a later date despite all practicable

precautions having been taken. This is a most serious drawback to the method. If in the process of obtaining a "free" herd a "resistant" herd were acquired, then the method would be much more attractive. It has become usual in Queensland to advise against attempts at eradication of brucellosis if the percentage of infected cattle detected at the first test of a herd exceeds 15. Nevertheless, on some farms the test-and-slaughter method of control has been used to the complete satisfaction of all concerned even when the initial infection in the herd has been comparatively high.

It is much more attractive when testing is being carried out on an area basis—that is to say, testing is carried out on a group of adjacent farms at one and the same time. This largely eliminates the risk of re-infection.

In deciding on whether to control brucellosis by test and slaughter the following considerations must be kept in mind:—

(1) Danger of re-infection after herd has been "freed" from the disease.

(2) Economic value of the animals in the herd.

(3) Percentage of animals found infected on the occasion of the first test of the herd.

(4) Is the herd self-contained?

In general it can be stated that stud herds with a low initial infection are the most suitable herds in which to use the test-and-slaughter method. Grade herds which are not self-contained present difficulties which are not easy to overcome.

CONTROL BY VACCINATION.

Control by vaccination has been attempted ever since the bacterial nature of brucellosis was first discovered, 50 years ago. It was early evident that dead vaccines had no immunizing effect against the disease and that living vaccines must be used. It was also evident that the virulence (power to produce disease) of the microbes in the vaccine must not be reduced in any way otherwise the immunizing power would be correspondingly reduced. The use of such fully virulent live vaccines had serious disadvantages. Abortions were prevented but the disease itself was perpetuated; the infection became established in the vaccinated animals and was shed in the afterbirth and milk, thus exposing other animals as well as man to the risk of infection.

In Australia the use of fully virulent live vaccines has at all times been prohibited.

Strain 19.

In 1925 Buck, working in the United States of America on an attempt to improve vaccination against brucellosis in cattle, came across a strain of *Brucella abortus* (since known as Strain 19) which was of considerably less virulence than is usual with this organism. Later Buck tested the immunizing power of this strain when used as a vaccine and concluded that, notwithstanding its lower virulence, it was capable of producing a serviceable immunity. Buck's view has been generally accepted and the use of Strain 19 vaccine is increasing in most parts of the world.

Advantages and Disadvantages.

Strain 19 has several advantages over the more virulent strains of *Brucella abortus* which were earlier in use as vaccines. It does not become established in the vaccinated animal other than in exceptional circumstances; and it never does when its use is confined to calves. It does not spread disease from vaccinated to unvaccinated animals. It does not become localized in the udder and hence is not shed in the milk.

Plate 75.

INOCULATION WITH STRAIN 19 VACCINE.—The injection is made low down on the side of the neck almost over the brisket. Note the loose skin which makes the injection easier and safer for the operator and allows of ample room for local swelling caused by the vaccine without detriment to the calf.

When properly applied, Strain 19, apart from some local swelling produced at the site of inoculation, is not harmful to the animal in any way whatsoever.

The main disadvantage of Strain 19 is that the immunity conferred by it is not absolute. If the degree of exposure to infection is high enough, then the vaccinated animal will in many instances contract brucellosis. There is also a difference of opinion as to how long the immunity lasts. It is at its highest a few weeks after vaccination is carried out and then falls very gradually until, at the end of a period which remains to be definitely determined, it probably becomes of little or no value. But this is after all no different from the position in respect of many other vaccines. The important thing is whether Strain 19 vaccine helps to bring brucellosis under control. There can no longer be any doubt on this point; its use is certain to effect improvement when intelligently applied. Abortions are not eliminated altogether but they are reduced to a point where they cease to be of any great consequence. Accompanying this is a decided improvement in the fertility level in the herd, easier rearing of calves, and increased production generally.

There can be no doubt that ultimately another type of vaccine will become available which can be used as a reinforcing inoculation after the first or second calf has come along. The effect of this will be of course to bolster up the waning immunity conferred by the original injection of Strain 19. Strain 19 itself cannot be used for the second inoculation, since it is not considered satisfactory for general use in adult cattle.

There is no truth in the suggestion or rumour that Strain 19 leaves many heifers unable to breed. The experimental evidence in this regard is very clear; no difference can be discerned between the breeding capacity of vaccinated and that of unvaccinated heifers.

Precautions to be Observed.

In Queensland the use of Strain 19 vaccine is subject to permit, firstly because it consists of living organisms to some extent dangerous to man, secondly because it must be used under special conditions. For these reasons its use is confined to approved persons, that is, veterinary surgeons and certain officers of the Department of Agriculture and Stock.

All who carry out vaccinations are required to undertake to observe the following conditions:—

(1) No male cattle to be vaccinated.

(2) No pregnant animal, irrespective of age, to be vaccinated.

(3) No animal over 12 months to be vaccinated.

(4) As far as possible vaccination to be confined to calves between the ages of 4–8 months.

(5) Records of all calves vaccinated to be kept.

Calves under four months of age are not vaccinated for the reason that many of them fail to "take" and little or no immunity results.

No bull calves are accepted, for the reason that there is little or no reliable information as yet on the results of using Strain 19 vaccine on male animals. There is reported to be a possibility of Strain 19 localizing in the testicles of male animals and setting up a permanent infection.

Vaccination of adult cattle is not permitted in Queensland for the following reasons:—

(1) Permanent infections may be set up.

(2) Long-lasting positive reactions to the "blood test" are set up in nearly all cases.

(3) The local reaction to vaccination is very often severe and a permanent lump may remain at the site of inoculation.

(4) Milk flow is often seriously depressed for 2–3 weeks following inoculation with the vaccine.

(5) As vaccination of adult cows (even if practised) must be carried out when cows are "empty," a series of visits must be made to each farm before all the cows can be inoculated. The man-power problem involved here is considerable, and in combination with the other disadvantages has brought vaccination of adult cows into disfavour.

Vaccine Supply and Costs.

The vaccine is put up in bottles containing 100 c.c., or sufficient for 20 calves, the dose being 5 c.c. As the vaccine is comparatively costly, as well as being in short supply, waste cannot be tolerated. It is essential that groups of farmers get together to ensure that as near as possible to 20 or multiples of 20 calves are available in the one locality for inoculation on any one day.

The charges made for inoculation by private veterinary surgeons will naturally have some relation to the number of calves and the distance travelled. The Department of Agriculture and Stock charges 2s. per calf as a flat rate, but it is only reasonable to expect that as the distance travelled increases so should the number of calves.

Vaccination is especially suited to those herds which are already heavily infected. There is, however, a case for vaccination whenever the danger of infection or of re-infection exists.

When vaccination is used to control brucellosis there is not the same necessity or desirability for a herd to be self-contained as is the case when "test and slaughter" is the method used. It is quite untrue that vaccination gives worth-while results only in self-contained herds.

Vaccination and Blood Testing.

Vaccination and the use of the blood test may be combined to advantage. Vaccinations must be restricted to heifer calves not older than eight months. This is for the reason that vaccination with Strain 19 is followed by the development in the blood of those antibody substances which are responsible for a positive reaction to the "blood test." This is to be expected and in fact is looked for as evidence that the vaccine has "taken." This positive reaction in vaccinated calves has quite a different significance from that given by animals which have contracted the natural disease. In the former case it indicates only a temporary infection with no danger of organisms being shed by the animal; in the latter case it indicates a permanent infection with every prospect of organisms being shed by the animal.

The positive reaction given by vaccinated calves gradually fades; but the older the calf at the time of vaccination, the longer the reaction lasts. Once the vaccinated calf reaches the age when a natural infection becomes a possibility, confusion and doubt as to the significance of the positive reaction become inescapable. The reason for this is that the "blood test" as at present constituted does not enable us to distinguish between a reaction due to vaccination and one due to natural infection. If careful records are kept of the animals which are vaccinated as calves there is less room for doubt, but it cannot be removed altogether.

It is for the reasons stated that, when combining vaccination with the use of the "blood test," the age of the calves which are vaccinated must be kept down rather lower than would otherwise be the case. Even so, in order to retain a "negative" herd it may still be necessary to dispose of a small percentage of calves vaccinated, because they fail to return to a "negative" state.

The main advantage of combining vaccination with the "blood test" is that an owner can look forward to having a "resistant" as well as a "free" herd and thus help materially to eliminate the possibility of re-infection and consequent breakdown.

In the early stages of an eradication programme the combination also enables the economic impact to be spread by disposing of reactors over a longer period. There is not the same pressing urgency about disposing of all infected cattle, as the young stock are protected (by vaccination) before they reach a susceptible age. This is obviously likely to be especially attractive to owners of stud herds in which a medium to high initial incidence of infection exists. Eradication can come four or five years later when the herd is composed largely of animals which have been vaccinated as calves.

Vaccination as an adjunct to "test and slaughter" should be seriously considered whenever the risk of re-infection of a "free" herd can be regarded as real. The consequences of this latter can be extremely serious.

Time to Start Vaccination.

Calfhood vaccination with Strain 19 is a long-term project, no matter what the circumstances in which it is used. It takes at least two years to obtain useful results in even small measure, and 4–6 years must elapse before its full benefits can be obtained. The aim is to "turn the herd over." It is very necessary to realize this and not postpone vaccination until the disease strikes. The time to start vaccinating is now.

USE OF DRUGS, &c.

The cure of brucellosis by the injection of various chemical substances has in the past been the subject of many claims by different people. A very popular "cure" was a weak solution of carbolic acid administered as a hypodermic injection. This in common with many others has been shown to be useless.

With the advent of the sulpha drugs high hopes were held, but these too proved useless. Even penicillin has been found wanting.

A more recent product known as streptomycin holds out some promise, but it is not yet in the realm of practical farm use, being scarce and very expensive.

Douching or syringing the vagina with antiseptic fluids helps to reduce the amount of infective material dispersed by affected animals, but is not a cure of the disease itself.

RELATION OF BRUCELLOSIS TO VAGINITIS AND MASTITIS.

All three conditions are often seen in a herd at the same time but they are quite unrelated. Vaginitis is often seen in herds which have been proved (by blood test) to be free from brucellosis. Treatment of vaginitis will have no influence on brucellosis should the latter be present in the animal.

With regard to mastitis, it is necessary to note that *Brucella abortus* is found in the udder of infected cows during the time they are not in calf. Its presence does not, however, cause any inflammation of the udder and is not considered to have any bearing on whether the cow will or will not become affected with mastitis.

RELATION TO HUMAN DISEASES.

Both *Brucella abortus* and *Br. suis* can cause undulant fever in man.

The disease due to *Brucella abortus* is very similar to Malta fever (due to *Brucella melitensis*). It is usually contracted from close contact with cattle and hence occurs chiefly in farmers, veterinarians, cattle buyers and other people closely associated with cattle. There is also the possibility of infection occurring through drinking unpasteurized milk from infected herds.

The disease in humans may be serious, especially as treatment is reported to be unsatisfactory.

Cases of undulant fever have not been common in Australia up to the present time, but there can be no certainty that this state of affairs will continue.

It is clear that brucellosis in cattle has features which are of interest to the community as a whole as well as to the owner of the affected cattle.

Animal Health Station Services.

During the year ended 30th June last, the Department's Animal Health Stations at Yeerongpilly (near Brisbane) and Oonoonba (near Townsville) received nearly 18,000 specimens for examination. Of these, about 12,000 were blood samples for examination for brucellosis (contagious abortion) of cattle and 1,700 for brucellosis of pigs. The other samples were of milks, dipping fluids, animal tissues, &c., submitted for diagnostic purposes.

More than 300,000 doses of pleuro-pneumonia vaccine and 274,000 doses of infectious labial dermatitis (scabby mouth) virus were supplied to stockowners. Graziers purchased 146 steers for use as reservoirs for tick fever vaccine, and 213 stud animals going into ticky country were held at the stations for vaccination purposes.

At both stations, experimental work on newer types of insecticides for use in cattle dips against the cattle tick was continued. The insecticides used included DDT, benzene hexachloride (B.H.C.), and chlordane.

FARMERS' WOOL SCHEME DISCONTINUED.

An advertisement concerning the Department's Farmers' Wool Scheme which had appeared in an earlier issue of the Journal was re-inserted by error in the September issue.

Will farmers please note that the Department is not now receiving wool for classing? The scheme was discontinued from 31st August because a similar service is now being operated by commercial firms.

Royal Show Champions.

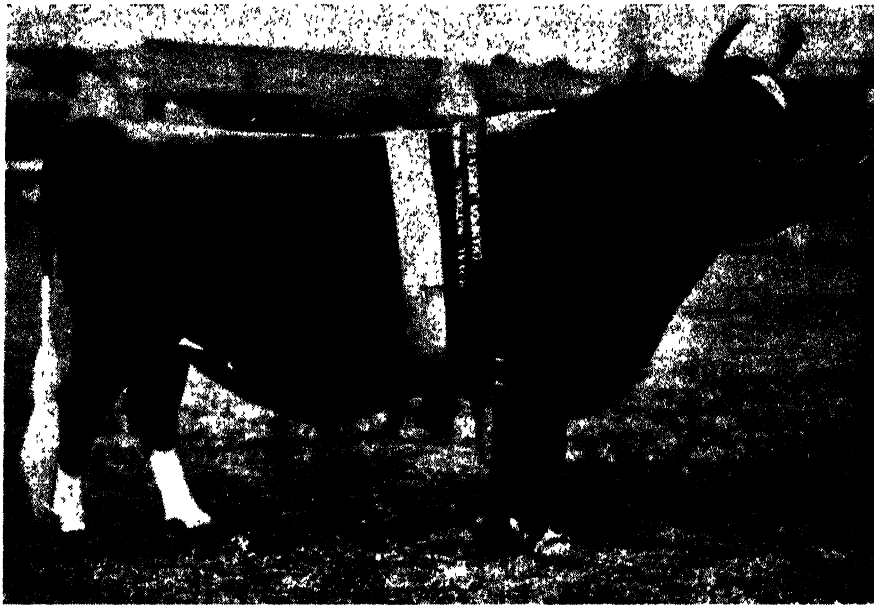


Plate 76.
Champion Jersey Bull.—Navua Victorious Samaritan.

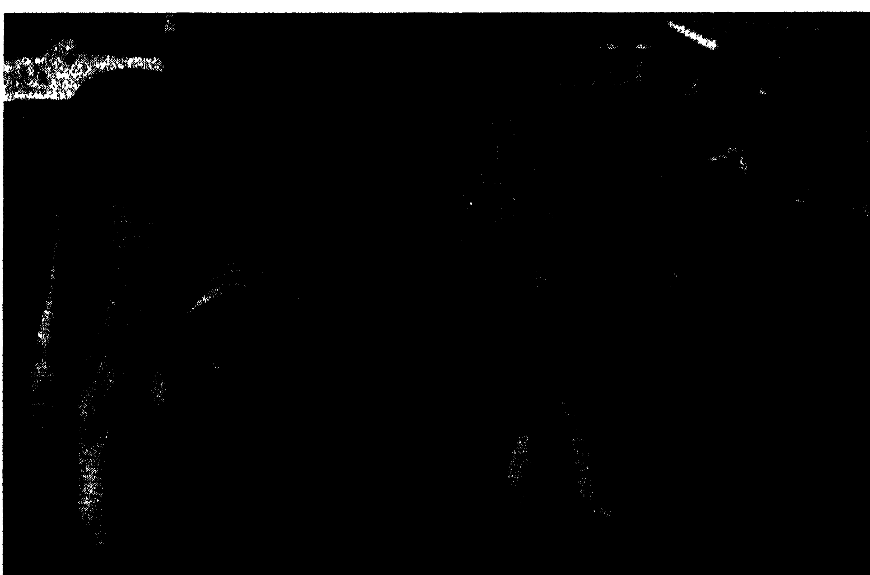


Plate 77.
Champion Guernsey Cow.—Fernhill Bouquet.

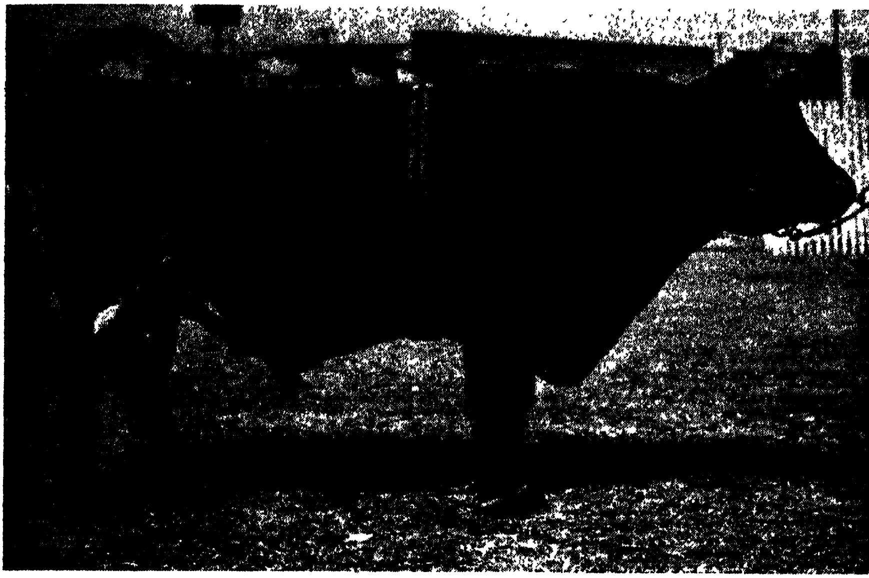


Plate 78.
CHAMPION A.I.S. BULL.—Sunny View Kitchener.

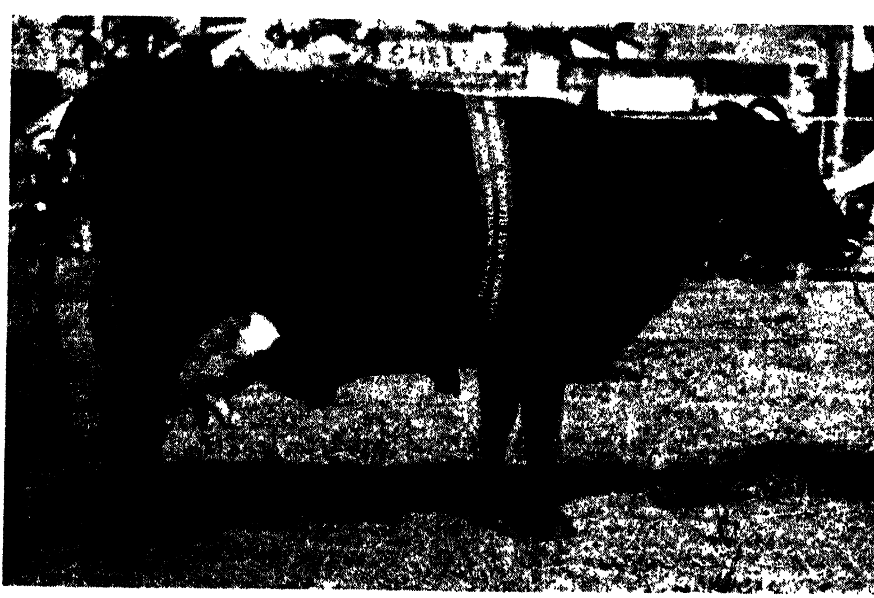


Plate 79.
CHAMPION A.I.S. COW.—Sunny View Gem 8th.

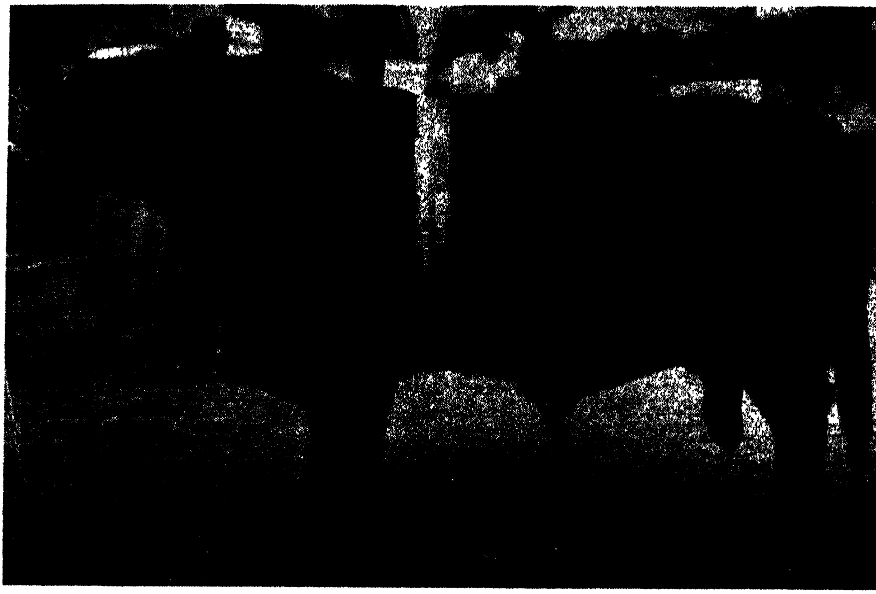


Plate 80.
CHAMPION SHORTHORN BULL.—Tarvas Mandarin.

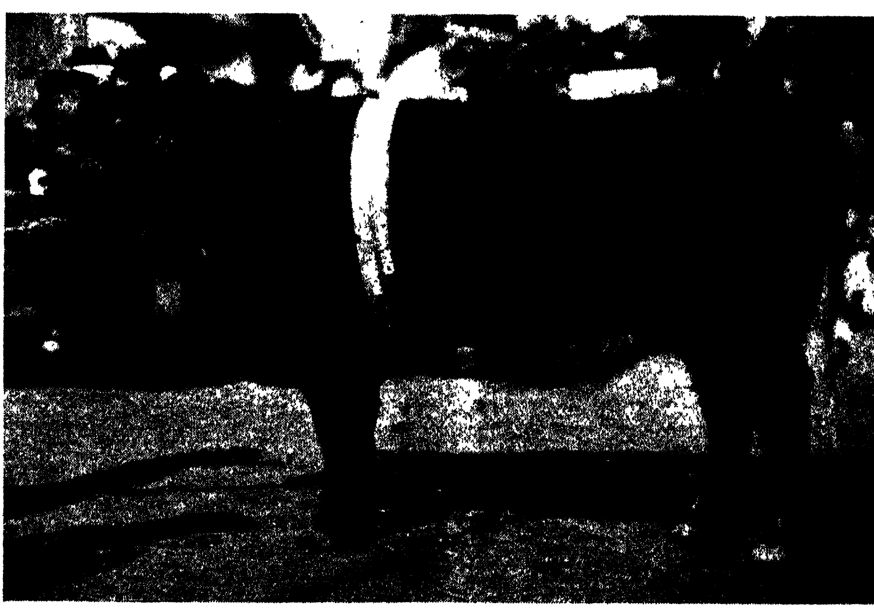


Plate 81.
CHAMPION SHORTHORN COW.—Turanville Shy Dawn.

MARKETING

Production Trends—September.

Pastures on the Darling Downs and in the Maranoa and Warrego districts were in good condition, but in the Central District and on the Central Highlands drought conditions extended. Dry conditions prevailed at Hughenden, whilst at Cunnamulla the position deteriorated. The outlook in most pastoral areas will remain poor unless early storm rains are experienced.

The rains on the Darling Downs and in the Maranoa district were of particular value to grain and fodder crops, and land is in better condition for preparation prior to the planting of summer crops. The area planted to wheat for grain is now estimated to be at least 550,000 acres, and it is expected that a record harvest of 12,000,000 bushels will result.

In the sugar growing areas weather conditions have been dry and, although favourable for uninterrupted harvesting, have adversely affected young plant cane. In all areas estimates of cane for crushing are showing increases over earlier figures.

Dairy production has been well maintained for this time of the year, stock are in good condition, and water supplies are adequate. The estimate of butter production for September is 7,280,000 lb. If this estimate is realised, it will be the highest butter production for the month of September since 1939.

Brisbane Wholesale Markets.

During the month of September there was a general easing of prices of greens with values for cabbages almost at glut levels at the end of the month. Prices for all other vegetables remained at very high levels. Prices for the decreased supplies of tomatoes offered, and particularly for northern tomatoes, reached what must have been almost record high levels.

Bananas were in moderate supply and prices were fairly high. Quantities of pineapples were falling off and values remained firm, but increased supplies of papaws, particularly from local districts, resulted in a general reduction of price.

Oranges were plentiful. Choice fruit sold well at payable prices, but other grades were slow to clear at from 6s. per bushel case.

Strawberry supplies were diminishing during the month and quality was rather poor.

The Egg Marketing Board.

The month of September saw the completion of a quarter of a century of organised marketing in the egg industry. The Egg Marketing Board, which was constituted on 19th June, 1923, and commenced to function on 1st September, 1923, was the second Board to be constituted under the Primary Producers' Organisation and Marketing Acts. As a matter of interest the original members of the Board were—Messrs. H. M. Stevens (Chairman), J. R. Wilson, R. A. Chapman, N. H. Campbell and J. Hutton (representing the egg producers), and H. H. Bentley (representing the Council of Agriculture).

Japanese Agriculture.

For the next five to ten years Japan will have to import from 15 to 20 per cent. of its food requirements in order to feed its population of 75 million, an average caloric intake of 2,100 to 2,200 calories per person per day. This is revealed by an article appearing in "Foreign Agriculture" for August, 1948.

Agriculture is the most important single industry in Japan, because about 50 per cent. of the national industrial capital is invested in it, and because 47 per cent. of the population is engaged in it for a livelihood. The main crops are rice, barley, wheat, sweet potatoes, and potatoes. Rice dominates the entire agricultural

economy and in 1945 this crop occupied approximately 53 per cent. of the total cultivated area. Barley ranks second among the crop plants in Japan, and from a position of relative unimportance wheat in recent years has also become one of the major crops. About 75 per cent. of the wheat crop is milled into flour, the remainder being pearled and cooked with rice.

The facts gathered during the first year of military occupation of Japan have revealed relatively few defects in the Japanese Government programme for the "maximising" of indigenous food production. The average yields per unit area are already amongst the highest in the world, but production of the five principal field crops on which the food supply of the country is so heavily dependent will have to be increased if Japan is to become self-sufficient insofar as her food requirements are concerned.

CURRENT FEEDING VALUES FOR MONTH OF SEPTEMBER, 1948.

(Division of Animal Industry and Division of Marketing.)

Feed.	Starch Equivalent Value per 100 lb.	Digestible Crude Protein Value per 100 lb.	Average Wholesale Selling Price at Brisbane.	Cost per Starch Equivalent Unit.	Remarks.
				d.	
			STARCH CONCENTRATES.		
Wheat	72	8	7s. 7d. bushel	2·11	Maize very scarce. Light supplies auctioned after price control lifted realised 10s. 4d. to 10s. 8d. bushel. Sorghum supplies negligible. Only light supplies of bran and pollard.
Wheat Meal	72	8	£14 13s. 4d. ton	2·44	
Maize	78	8	7s. 11½d. bushel	2·19	
Maize Meal	71	8	£16 10s. 0d. short ton	2·78	
Sorghum	71	7	Not available		
Sorghum Meal	71	7	Not available		
Barley	71	7	Not available		
Barley Meal	71	7	Not available		
Oats	62	8	5s. 11d. bushel	2·86	
Crushed Oats	62	8	6s. 1d. bushel	2·94	
Pollard	66	10	Not quoted	..	
Bran	56	10	£12 10s. 0d. short ton	2·68	
Molasses	50	..	47s. 6d. drum	2·59	
			PROTEIN CONCENTRATES.		
Meatmeal	80	55	Not quoted		
Linseed Meal	72	25	Not quoted		
Peanut Meal	78	43	Not quoted		
Blood Meal	63	68	Not quoted		
Cottonseed Meal	67	33	Not quoted		
Meat and Bone Meal	68	46	Not quoted		
			ROUGHAGES.		
Lucerne Hay and Chaff	35	15	Hay £8, Chaff £11 5s. 0d. ton	2·45–3·44	Market steady.
Oaten Hay	35	3	£6 ton	1·83	
Wheaten Hay	35	3	Not available	..	
Oaten Chaff	35	3	£9 10s. 0d. ton	2·90	Quality lower.
Wheaten Chaff	35	3	£7 5s. 0d. ton	2·21	Quality lower.
			MINERAL SUPPLEMENTS.		
Ground Calcium Carbonate (Limestone)			..	..	
Bone Meal			£11 10s. 0d. ton	..	In short supply.
Bone Flour			..	..	
Shell Grit			4s. 2d. bag	..	Scarce.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

FORMING GOOD SLEEPING HABITS FOR BABY.

MANY mothers and fathers are worried because their babies or children do not sleep well, and lots of questions are asked as to the reason for this.

Parents would do well to remember that habits of sleep develop much in the same way as habits of eating. A tired baby learns that sleeping is pleasant, and if he is made comfortable beforehand by sufficient food, by making him dry, and adjusting his bedclothes to the temperature of the room he will go to sleep. Very soon he will develop the habit of sleeping at regular times.

Although good sleeping habits are so easy to establish in early infancy they will only be maintained if baby continues to get satisfaction from them.

If mother disturbs her baby's sleep by waking him up to show him off to her friends, if daddy arouses him for a game when he comes home from work, baby will soon decide that it is more exciting to stay awake, and then we have the complaint, "Baby won't go to bed until I do."

It is necessary, then, to allow baby to associate his bedtime with the pleasant feeling of food and warmth and the sleepiness which usually develops towards the end of his feeds.

Sleeping Conditions.

The conditions that make sleep refreshing for older people are also necessary for baby—namely, plenty of fresh air passing in a current through the room, no light shining in the eyes, quiet, a clean body and clean comfortable night clothing. Baby should learn to sleep through ordinary household noises but he needs reasonable quiet.

It is best for baby to sleep in a bed by himself. Besides being more comfortable it is safer, because a baby sleeping with his mother may be overlain and suffocated. In addition, he lies close to his mother and probably breathes in her used-up breath instead of the pure fresh air which he needs. He sleeps less soundly because he is disturbed by his mother's movements and when awakened may develop the bad habit of expecting to be fed one or more times during the night.

Therefore, see that baby has his own cot with firm mattress, soft chaff shakedown, and a very small pillow or no pillow at all. Large soft pillows are unhealthy and dangerous.

Sleeping Routine.

In developing good sleeping habits, regularity is important. In the early months of life baby should sleep most of the time, waking only for food. As he gets older he stays awake a longer and longer part of each day. Usually the first

wakeful period noticed is in the afternoon before the 6 p.m. feeding. As soon as this wakeful period develops baby needs a real bedtime, which needs careful management from the beginning.

After a quiet playtime free from excitement baby is prepared for bed. He is washed, his napkin is changed, and his night clothes put on.

He is then fed, cuddled a little by mother, his napkin changed again if necessary. Then he is quietly laid in bed and softly covered, the lights put out, the door closed and baby is left to go to sleep. If this is done at the same hour each night baby will soon become accustomed to going to sleep when he is put to bed.

If parents have any problem in regard to their children's sleeping and other matters connected with children, advice may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

RECIPES WORTH TRYING.

Date Drops.

Half a pound sifted flour, ½ teaspoon salt, ½ teacup chopped dates or ¼ teacup each of dates and nuts, ¼ lb. butter, 1 teacup sugar, ½ teaspoon vanilla essence, 1 beaten egg (fresh or dried), ¼ teacup milk. Sift flour and salt. Stir in dates or dates and nuts. Beat butter till softened. Gradually beat in sugar, then vanilla and egg. Stir in flour, alternately with milk, beating until smooth, after each addition. Drop from a teaspoon on to a greased baking sheet a little apart, and bake in a moderate hot oven for 8 to 12 minutes. There should be about 2½ dozen drops.

Lemon Sponge Pudding.

Six ounces self-raising flour, 2 oz. fat, rind of 1 or 2 lemons (according to size), ¼ lb golden syrup, barely 5 dessertspoons milk. Rub the fat into the flour, and add the finely-grated rind of the lemons. Mix well together, then make a hole in the centre. Drop the golden syrup into the centre of the flour and stir in the milk gradually, mixing in the flour by degrees. When it is all well mixed together, turn into a greased mould or basin, cover it with a greased paper, and steam for one hour. When cooked, turn on to a hot dish and serve with lemon sauce.

Fish Balls.

Two cups smoked fish, 4 cups potatoes, 2 eggs, 1 tablespoon butter, pepper. Cut the fish into pieces and mix with cooked, mashed potatoes. Add beaten eggs, butter and pepper. Beat well. Drop by spoonfuls into deep fat, frying until brown, and drain on paper.

Parsley Syrup.

Ingredients: 5 oz. parsley, including stalk, 1½ pints boiling water, 1 lb. sugar, 1 teaspoon vinegar.

Wash the parsley and roots thoroughly and dry in a cloth. Put in a saucepan with the water and boil till the water has reduced to a pint. Strain and return to pan with the sugar. Boil for 20 minutes, stir in vinegar and pour into hot jars. Seal while still hot. Makes about 3 lb. jars of syrup.

Cheese Splits.

For one dozen splits: Half a pound flour, ½ level teaspoon salt, 2 heaped teaspoons baking powder; ½ oz. fat, 2 oz. to 3 oz. grated cheese, about ¼ pint milk and water. Filling: Two teaspoons mayonnaise, 1 teaspoon vinegar, seasoning, 1 teaspoon chopped parsley, or chopped watercress, or both, 2 eggs. Sift together flour, salt and baking powder. Rub in fat, mix in cheese, stir in enough liquid to make a soft dough as for scones. Roll out to ½ inch thick, stamp out rounds with a 2½-inch plain cutter, brush with milk and water and bake in a hot oven for 15 to 20 minutes. When cold, split, spread with filling made by chopping eggs, seasoning, adding parsley and binding with mixed mayonnaise and vinegar.

Garnish with parsley and watercress.

QUEENSLAND WEATHER IN SEPTEMBER.

During the month opportune and over average aggregate rains of approximately one to three inches were recorded from the Warrego district east through the Maranoa and Downs to the South Coast, Port Curtis and Moreton Divisions. The Moreton, Downs and Maranoa areas received most of the two to three inch totals during unsettled periods between the 14h and 17th and 24th and 27th. Apart from some local thunder and hail damage in the middle of the month these rains followed a dry spell lasting through most of July and August and were of general benefit to the wheat areas of record acreage and also gave a needed seasonal impetus to dairying and other farming pursuits in the South-East districts. Some scattered variable rains penetrated the adjacent sections of the Central Lowlands and Highlands and the Rockhampton to Mackay area of the Central Coast, but in western border, central interior and tropical sections of the State it was practically rainless. Even in the Central Coast and Far North Coast areas many stations reported no rain. Practically all the above pastoral areas need early spring storms for temporary relief and further follow-up rains to recuperate from the protracted dry conditions and lack of normal summer monsoonal rains.

Pressure.—During the month a series of continental high pressure centres moved from west to east across the continent on an inland axis. These were of the fine weather type as far as Queensland was concerned and intervening lows were mostly unfavourably centred to the south of the continent. An isobaric dip formation about the middle of the month in the Gulf country and western Queensland showed a weak upper air north-west circulation on the 15th and this wave formation brought rain and thunderstorms in the south-east quarter of the State. Another somewhat similar trough formation and more active cold front action brought a renewal of the variable rains and local storms in the Southern Divisions 24th to the 26th. Unsettled weather extended to North-east New South Wales and there were some heavy local falls in a restricted area around the Macpherson Range and adjacent Northern Rivers.

Temperatures.—Average maximum temperatures mostly about normal, greatest range Cairns and Mitchell 1.9 deg. and 1.8 deg. below respectively. Warmer towards the end of the month with some over 100 deg. Maximum readings 29th and 30th (Boulia 104 deg).

Average minimum temperatures generally below normal, 0.2 deg Mitchell, 0.7 deg. Longreach, others mostly 3 to 5 deg. Frosts were recorded at Tambo 2-4th; Mitchell 3-7th, 10-11th; Kingaroy 3-8th, 10-12th (21 deg. on 4-5th); Stanthorpe 3-8th, 10-12th. 18-19th, 29-30th (19 deg. on grass 4th).

The rain position is summarised below:—

Divisions.	Normal Mean.	Mean September 1948.	Departure from Normal.
	Points.	Points.	Per. Cent.
Peninsula North	13	3	77 below
Peninsula South	24	0	100 „
Lower Carpentaria	17	1	94 „
Upper Carpentaria	36	2	94 „
North Coast, Barron	92	0	100 „
North Coast, Herbert	155	10	94 „
Central Coast, East	108	13	88 „
Central Coast, West	70	11	84 „
Central Highlands	102	63	38 „
Central Lowlands	65	13	80 „
Upper Western	29	1	97 „
Lower Western	44	4	91 „
South Coast, Port Curtis	141	174	24 above
South Coast, Moreton	206	289	40 „
Darling Downs, East	167	206	23 „
Darling Downs, West	104	213	105 „
Maranoa	118	313	165 „
Warrego	88	112	27 „
Far South-West	56	19	66 below

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

DECEMBER, 1948.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.45	6.28	Cairns	51	7	Longreach	44	26
6	4.46	6.32	Charleville	30	24	Quilpie	33	37
11	4.47	6.35	Cloncurry	65	35	Rockhampton	19	1
16	4.49	6.38	Cunnamulla	27	32	Roma	19	15
21	4.51	6.41	Dirranbandi	16	22	Townsville	42	8
26	4.54	6.43	Emerald	28	11	Winton	52	29
31	4.56	6.46	Hughenden	49	21	Warwick	2	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Day.	Rise.	Set.
	a.m.	p.m.
1	4.40	7.06
2	5.31	8.08
3	6.25	9.04
4	7.23	9.53
5	8.22	10.35
6	9.20	11.12
7	10.16	11.44
8	11.09	..
	p.m.	a.m.
9	12.02	12.13
10	12.53	12.41
11	1.46	1.08
12	2.40	1.37
13	3.37	2.07
14	4.38	2.41
15	5.41	3.21
16	6.45	4.08
17	7.47	5.03
18	8.45	6.05
19	9.35	7.12
20	10.20	8.20
21	11.59	9.28
22	11.34	10.33
23	..	11.36
	a.m.	p.m.
24	12.07	12.39
25	12.40	1.41
26	1.14	2.44
27	1.52	3.49
28	2.34	4.52
29	3.21	5.55
30	4.14	6.53
31	5.10	7.45

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	29	10	45	24	20	0	52	27
6	27	13	43	28	18	2	51	31
11	17	19	33	36	8	10	37	41
16	9	30	25	44	0	20	26	53
21	14	25	30	41	5	16	34	48
26	24	13	40	29	15	3	46	32
31	30	9	46	24	21	0	53	26

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	53	4	67	33	50	19	44	5
3	56	2	68	32	52	17	46	3
5	52	7	66	35	50	21	43	8
7	44	16	61	41	45	26	37	15
9	34	26	54	47	38	33	29	22
11	25	31	47	51	32	36	21	26
13	15	41	40	58	25	44	14	35
15	6	50	35	63	20	49	6	42
17	2	56	33	67	17	53	3	46
19	8	52	36	65	21	50	8	44
21	19	43	42	56	27	45	17	36
23	28	31	50	52	34	37	24	27
25	35	19	54	43	39	28	29	17
27	46	9	62	36	47	22	38	9
29	54	8	67	32	51	18	44	4
31	55	3	68	32	51	18	45	4

Phases of the Moon.—New Moon, 1st December, 4.44 a.m.; First Quarter, 8th December, 11.57 p.m.; Full Moon, 16th December, 7.11 p.m.; Last Quarter, 23rd December, 3.12 p.m.; New Moon, 30th September, 7.44 p.m.

On 22nd December the Sun will reach its maximum angle south of the equator and will then rise and set, as viewed from Queensland, from 25 degrees to 27 degrees south of true east and true west respectively.

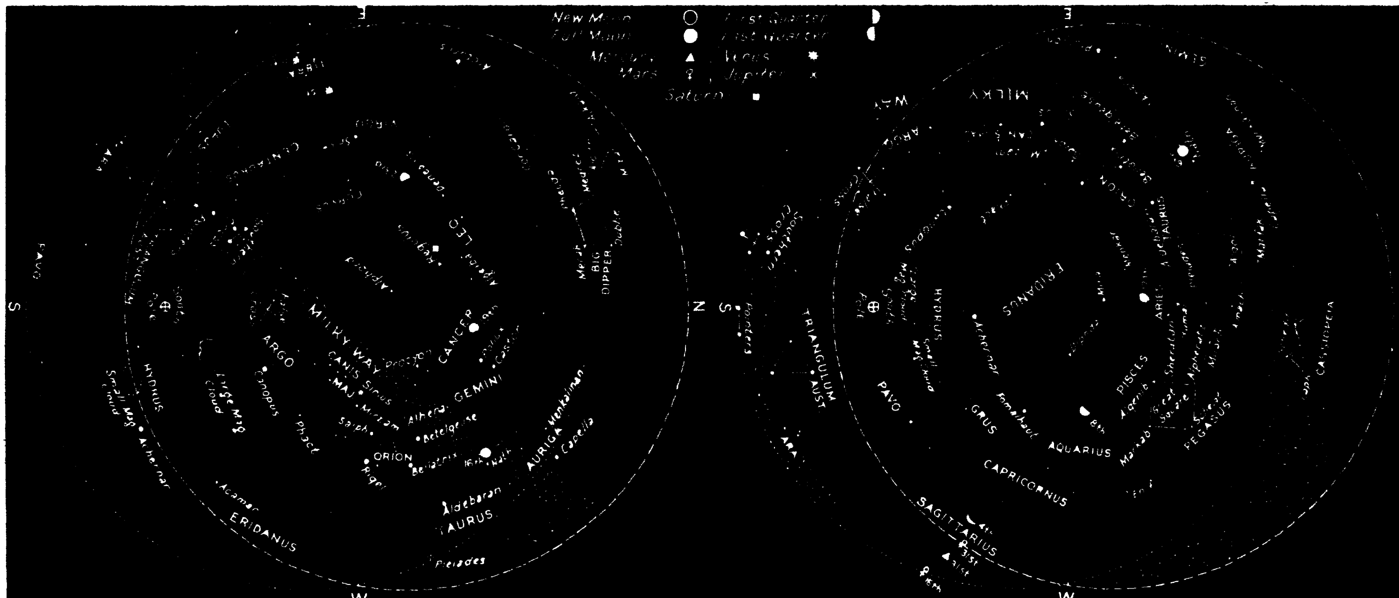
Mercury.—At the beginning of the month, in the constellation of Scorpio will rise 20 minutes before the sun but on the 12th it will be in line with the Sun, after which it will become an evening object and at the end of the month, in the constellation of Sagittarius will set 48 minutes after sunset.

Venus.—Still a brilliant object in the morning sky. At the beginning of December, in the constellation of Libra will rise between 3 a.m. and 4.15 a.m. and after passing through the constellation of Scorpio, at the end of December, in the constellation of Ophiuchus, will rise about 10 minutes later than on the 1st.

Mars.—In the constellation of Sagittarius will be visible low in the west during evening twilight. On the 1st it will pass 1 degree to the south of Jupiter when it will set about 2 hours after the Sun. By the end of the month it will set only 1 hour after the Sun.

Jupiter.—In the constellation of Sagittarius also, and visible low in the west during evening twilight in the early part of the month but by the end of December will be too close in line with the Sun for observation.

Saturn.—In the constellation of Leo, on the 1st will rise at midnight and at the end of the month will rise between 10 p.m. and 11.15 p.m.



Star Charts.—The chart on the right is for 8.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border on the 15th December. (For every degree of longitude we go west, the time increases by 4 minutes). The chart on the left is for 9 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales Border. When facing North hold "N" at the bottom; when facing South hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars, which do not change their relation to one another moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

SEPTEMBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of years' records.	Sept. 1947.	Sept. 1948.
North Coast.	In.		In.	In.
Atherton	0·74	42	2·48	0·00
Cairns	1·65	61	2·92	0·00
Cardwell	1·47	71	5·92	0·17
Cooktown	0·56	67	0·61	0·00
Herberton	0·55	57	1·48	0·00
Ingham	1·51	51	3·09	0·12
Innisfail	3·52	62	7·43	0·02
Mossman	1·93	19	5·21	0·19
Townsville	0·70	72	2·62	0·00
Central Coast.				
Ayr	1·21	56	2·49	0·00
Bowen	0·77	72	1·18	0·00
Charters Towers ..	0·75	61	2·32	0·04
Mackay	1·60	72	1·26	0·13
Proserpine	1·89	40	4·26	0·09
St. Lawrence ..	1·19	72	1·81	0·12
South Coast.				
Biggenden	1·38	44	3·64	0·95
Bundaberg	1·48	60	5·56	0·94
Brisbane Bureau ..	1·93	96	2·93	2·98
Caboolture	1·76	67	3·49	1·84
Childers	1·64	48	4·85	1·39
Crohamhurst	2·49	50	3·87	..
Esk	1·94	56	2·67	1·78
South Coast—cont.	In.		In.	In.
Gatton College ..	1·43	44	2·65	..
Gayndah	1·47	72	4·26	1·68
Gympie	2·02	73	3·45	1·83
Kilkivan	1·61	62	3·39	1·07
Maryborough ..	1·84	72	4·57	1·40
Nambour	2·26	47	5·07	2·60
Nanango	1·71	61	2·48	1·86
Rockhampton ..	1·22	72	2·92	0·39
Woodford	2·04	55	3·07	1·40
Central Highlands.				
Clermont	0·95	72	3·26	0·19
Springsure	1·22	74	3·54	0·56
Darling Downs.				
Dalby	1·61	73	2·27	1·75
Emu Vale	1·66	47	2·82	1·56
Jimbour	1·52	64	2·15	1·65
Miles	1·26	58	3·18	2·48
Stanthorpe	2·19	70	3·05	2·42
Toowoomba	2·01	71	4·05	2·81
Warwick	1·75	78	2·73	1·20
Maranoa.				
Roma	1·32	69	2·69	3·12
St. George	1·03	62	2·50	1·73

CLIMATOLOGICAL DATA FOR SEPTEMBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	81	61	87	30	52	3, 26	0	..
Herberton	..	79	49	86	9	35	3	0	..
Townsville	..	82	60	93	17	48	4	0	..
Rockhampton	30·07	82	53	97	29	38	4	39	2
Brisbane	..	..	..	..	..	..	..	..	..
Darling Downs.									
Dalby	..	74	44	90	30	32	4, 11	175	4
Stanthorpe	..	66	40	85	30	28	4	242	8
Toowoomba	..	68	45	82	7	35	6	281	7
Mid-Interior.									
Georgetown	..	90	56	100	30	42	2, 3	0	..
Longreach	30·09	85	58	100	29, 30	40	7	4	1
Mitchell	30·08	76	45	94	30	29	4	340	6
Western.									
Burketown	..	89	60	95	10, 15, 16, 27	49	3	0	..
Boulia	30·04	85	52	104	30	44	2, 3, 4	0	..
Thargomindah	30·03	80	50	103	30	40	3	5	1

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

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C. W. WINDERS, B.Sc.Agr.

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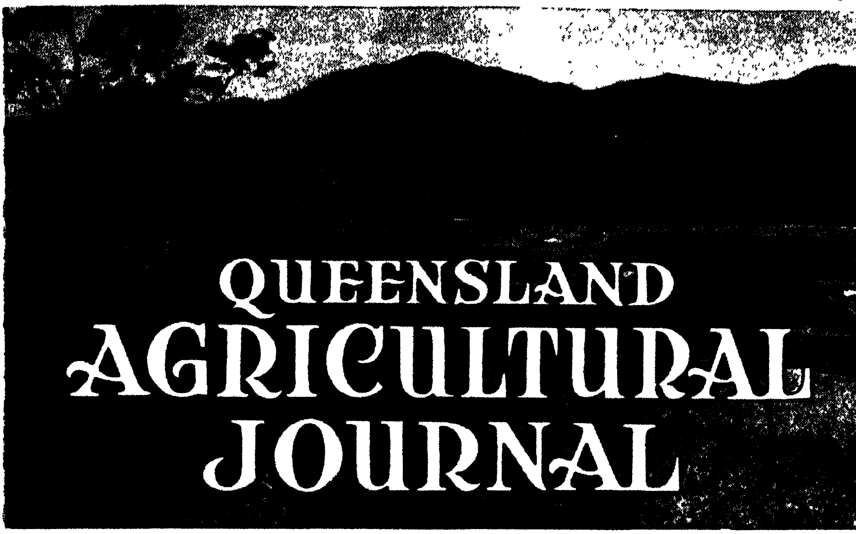
9

Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Art, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**



Volume 67 | 1 NOVEMBER, 1948 | Part 5

Event and Comment.

The Emphasis is on Feeding.

IN this issue appear two articles on livestock feeding which should be kept on hand by all farmers who use home-grown or bought feeds to supplement their pastures.

The feeding of stock is too often carried out in a haphazard manner, or at least without an adequate knowledge of the principles of feeding and the most economical feeding practices. It is not sufficient to know that proteins, carbohydrates, fats, minerals and vitamins are essential to animal health and production. The feeder must also understand the requirements of the various classes of stock which he is feeding, have a working knowledge of the composition of the common feedstuffs, and be able to calculate the cheapest "buy" that meets his needs.

Slapdash methods of supplementary feeding can be very costly and wasteful. While waste is to be deplored at any time, it is inexcusable in the present circumstances, with many essential feeding stuffs in short supply. Cost of feeding also must be carefully watched, since the margin between production costs and prices of commodities such as milk, butter and pigmeats is seldom wide enough to permit unnecessary expenditure on feedstuffs.

For most efficient feeding—which means using foodstuffs to the best possible advantage and at the lowest possible cost—the farmer must be able to devise rations which will yield maximum economic returns. In the feeding articles in this issue, he will find much to guide him in drawing up a ration that is near enough to being balanced and can be fed economically.

Correspondence Course in Agricultural Science.

AT the instance of the Premier of Queensland (Hon. E. M. Hanlon, M.L.A.), the University and the Departments of Public Instruction and Agriculture and Stock have planned a correspondence course in Agricultural Science, to commence next March.

The course is designed to give training in the elementary scientific basis of agriculture and its application to agricultural practice.

Groundwork Studies.

As some knowledge of chemistry and physics is essential to the proper understanding of soils and plant and animal growth, an introductory course on the principles of these subjects will be available for those requiring it. This course will consist of 30 lessons spread over a year.

The first year of the main course will be devoted to two subjects —(1) the science of animal life, and (2) the science of plant life. In the second year the science of soils and the growing of crops will be dealt with.

Specialisation.

After the first two years of the main course have been completed, the person undertaking the course can choose between livestock production and crop production for his specialisation in the final two years.

The livestock production course covers animal husbandry, stock breeds, pastures and other aspects of the subject.

Those electing to study crop production can specialise in either field crops or horticultural crops. Subjects common to both groups include plant pests and diseases.

Requirements for Certificate.

Any of the subjects can be taken individually, but to secure a Certificate 10 subjects will have to be completed. Six of these will be of 60 lessons each, and the other four of 30 lessons each.

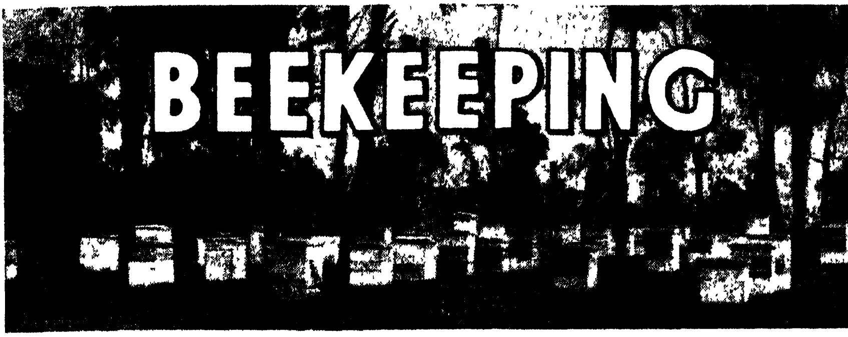
Cost of Enrolment.

For each individual subject there will be an enrolment fee of 10 shillings, payable as the subject is commenced. Thus, for the first year of the main course the fee for the two subjects will be £1. The fee for the introductory course is 10 shillings.

Each year there will be a summer school of about a fortnight's duration at the State Agricultural College. The cost of board, excursions and entertainment at this school will be about £5.

Where to Apply.

Farmers and intending farmers interested in the course may obtain full particulars from the Supervisor, Brisbane Technical Correspondence School, Webster's Building, Mary Street, Brisbane.



Importation of Bees.

COMMONWEALTH quarantine legislation with respect to bees provides that only queen bees and their escorts may be imported from overseas, and such importations must comply with the following requirements:—

The queen bee and a small escort must be consigned to the Chief Quarantine Officer (Animals) of the State of importation and be accompanied by—

(*a*) A declaration by the owner stating that they are free from disease and that they are from an apiary that is free from disease, and

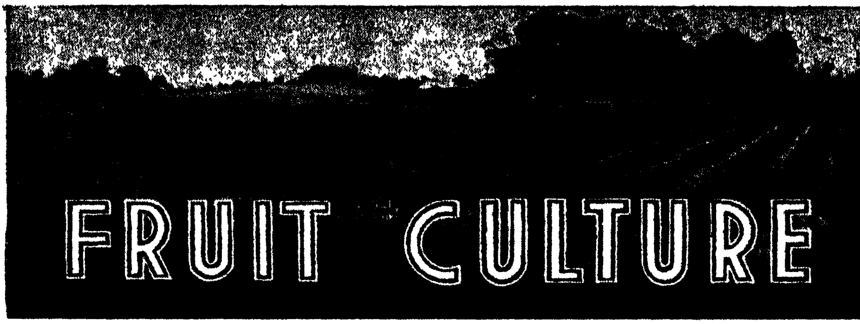
(*b*) Certification from a Government Veterinary Surgeon or other officer whose duties relate to agriculture in the exporting country, certifying that the bees are from a disease-free area and that Isle of Wight disease (acariasis) does not exist in that country or in any apiary within 20 miles of that in which the bees are kept.

If, on arrival, she and her escort are found healthy, the queen is placed in a new cage with a fresh escort and suitable food and a permit is issued for her release. If, on the other hand, the bees are found to be diseased, they are destroyed.

In 1943, it was found that certain Tasmanian apiaries were infected with *Braula coeca* and for this reason special quarantine conditions were imposed on bee exports from Tasmania to the mainland. These include certification of freedom from disease by a Government Veterinary Surgeon or Apiary Inspector.

The importation of used or second-hand bee hives from overseas is totally prohibited.

These precautions are taken to protect the Australian bee industry against the introduction into this country of *Braula coeca* infestation, acariasis and nosema disease, which are proclaimed diseases under the Quarantine Act, and any other diseases which may endanger the welfare of the beekeeping industry.



Cape Gooseberry Growing.

K. M. WARD, Horticulturist, Horticulture Branch.

THE cape gooseberry* is a native of Peru and belongs to the family *Solanaceae* in which are included the tomato, the potato and tobacco. The family is, of course, quite distinct from the one of which the English gooseberry is a member.

In Queensland, two types of cape gooseberry are grown, the more common being the small-fruited, yellow variety, the berries of which measure half-an-inch or a little more in diameter, while the other is the Golden Nugget variety (probably the variety *edulis*), which bears slightly larger fruit. The small berries of the former are usually preferred because of their superior flavour, but both varieties make good jams and preserves.

The plant itself is a non-woody shrub, commonly growing to a height of 3 ft. and having a spread of 5 to 6 ft. It is characterised by its habit of bearing fruit enclosed in an inflated calyx, the "husk." Though the plant is a perennial, it is in common practice almost invariably cultivated as an annual in this State. Under south-eastern Queensland conditions it will grow vigorously in spring, summer and autumn, producing its main crop between May and September.

Climatic and Soil Requirements.

Growing conditions and cultural practices required by the cape gooseberry are in many respects similar to those suitable for tomato culture in coastal districts. The plant is favoured by a warm spring and summer climate with abundant rain, but relatively dry weather is desirable during the maturing and harvesting of the crop. Severe frosts may kill most of the aboveground portion of the plant.

The most suitable soils are sandy loams and loams, but, provided there is free movement of water through them, the plant makes good growth on a rather wide range of soil types.

Propagation.

The plant is propagated from seeds, and the raising of cape gooseberry seedlings is carried out in much the same way as the raising of tomato plants. Germination, however, is inclined to be slow and irregular, and the percentage of seeds which eventually germinate is

* *Physalis peruviana* L.

normally rather low; hence, an ounce of seed is usually required to provide sufficient plants for an acre. Seed-beds can often be successfully established by squashing the fresh fruit and scattering the seed in the soil.

Plants are raised in well prepared seed-beds in which the seed is covered by a shallow layer of soil containing a good percentage of dried horse manure to prevent caking of the surface. The seed-bed should be kept moist, but shading is not usually necessary. As the seedlings grow they should be either thinned or pricked out into nursery beds in which the rows are 3–6 inches apart and the plants 2–4 inches apart. Eight weeks or more after sowing the seedlings should be ready for transplanting in the field, but they should first be hardened off by gradually reducing the water supply. Just prior to lifting they should be well watered to soften the soil.

Planting Out.

Planting out in the field should, of course, be preceded by suitable soil preparation, including the supplying of organic matter in the form of a green crop, and appropriate cultivation. Planting distances range from 5 ft. x 5 ft. (1,740 plants per acre) to 8 ft. x 8 ft. (680 plants per acre) and 8 ft. x 10 ft. (544 plants per acre) according to the fertility of the soil and the method of cultivation. If horse- or tractor-drawn implements are to be used in the early stages of plant growth, the widest spacing is most suitable. The plants are set out in late summer or early autumn, early planting being regarded with disfavour in some localities because such a practice renders the crop more liable to attack by corn ear worm. The cape gooseberry has a large proportion of its feeding roots near the surface of the ground, and as these roots spread across the rows cultivation with implements must be correspondingly reduced. Light cultivation with hand tools should suffice for weed control during the later stages of growth.

Fertilizing.

A basal application can be made by opening a furrow along the row to be planted and then spreading, over a distance of about 2 feet, 4 oz. of a mixed fertilizer at each point where a seedling is to be planted. After turning another furrow, a plant can be set at each position where the fertilizer has been placed. A basal dressing can also be applied by opening a hole with a hoe or some other suitable tool, spreading and mixing the fertilizer in it and then planting. Some growers apply fertilizer by topdressing soon after the plants become established and chipping the mixture into the soil with a hoe.

Suitable mixtures for use in this application are those containing 5–8 per cent. nitrogen, 10–15 per cent. phosphoric acid and 5–6 per cent. potash.

Topdressing with sulphate of ammonia or with the above mixtures, when the plants are about half-grown, is practised at times with beneficial results.

Harvesting and Marketing.

The crop will begin to mature approximately three months after planting out and harvesting may extend over a period of a further 2 to 3 months. Maturity of the berries is indicated by the changing of the husk colour from green to pale brown, and at this stage the fruit commences to fall from the bush. It is considered preferable to gather

the fruit from the ground rather than to pick it from the plant, as this ensures a maximum degree of uniformity in its colour and maturity. The gathering should be done at regular intervals, and in the course of this work it is well to jar or shake each plant so that all mature fruit will fall to the ground.

If necessary, the berries should be spread out in thin layers for a day or two to enable them to dry out. Preparation for market includes the dehusking of the fruit and placing it in suitable containers. Two-pound boxes are preferable if the fruit is to be forwarded to the fresh fruit market; and 12-pound boxes or half-bushel cases (holding about 26 lb.) if it is to be sent to the factory. The principal marketing period in southern Queensland is from June to September.

Yields and Bearing Period.

Under good cultural and general growing conditions, this crop can be expected to yield 3,000 lb. of fruit per acre, but heavier yields are obtained from time to time.

After the plants have borne one crop they are usually disposed of, but, in the absence of any diseases which are injurious to their roots or crowns, they can be pruned back to within six inches of the crown. Subsequent new growth will normally bear good crops of fruit.

Pests and Diseases.

The most important pests of cape gooseberries are cutworms, corn ear worm, red spider and tomato mite. Cutworms may prevent the establishment of the young plants by cutting them at ground level. To prevent this, 0·1 per cent. DDT may be sprayed on the ground or poison bran bait scattered over the area. The corn ear worm, a common pest also in tomatoes, may burrow into the young fruit and much of the crop may be lost. DDT sprays or dusts should be applied as required for this insect. Both red spider and the tomato mite may cause serious damage to the foliage. The former may infest the whole plant, with a preference for the young growth, while the tomato mite causes defoliation from the base upwards. This may be prevented by the regular use of sulphur either as wettable sulphur or lime-sulphur sprays, or as dusting sulphur. Further information on these pests may be obtained from the Entomological Section of the Department.

Plant disease, as distinct from insect injury, is seldom sufficiently serious in cape gooseberries to cause any concern. A leaf spot has been recorded but this is not of any economic importance. A virus disease, the same as that causing big bud of tomatoes, produces a tufty growth of the rosette type. Affected plants are a complete loss and if detected early in the growing season should be removed from the crop to prevent the spread of the disease.

VEGETABLE PRODUCTION

The Choko.

C. N. MORGAN, Senior Adviser in Horticulture, Horticulture Branch.

THE choko is a popular vegetable grown in coastal districts in Queensland for market, and it is also an excellent vegetable for the home garden in many parts of the State. It is an herbaceous perennial creeper, resembling the climbing cucumber, and given satisfactory treatment is a robust grower in the warmer months of the year. During the cold weather of July and August the plant temporarily dies back.

While in growth the plant forms under the ground a large tuberous root, and it is from this that growth starts in the spring. With good cultural treatment, regeneration will go on for many years, and therefore a grower must ensure, if he intends to grow chokos successfully, that his trellises are well constructed in order to last through the life of the plant. The plant is usually most productive in the later years; consequently, the early breaking down of a trellis represents a severe loss.

Trellising.

A strong well-constructed trellis may be made with round timber. Various types of trellises are used; the two illustrated are satisfactory. They can be made as long as desired—say two to three chains. One method of constructing the trellis (see Plates 82 and 83) is to set the posts 2 feet 6 inches in the ground with 22 feet between them at ground level and at an angle to allow 15 feet at the top. The tops of the posts are cut level, and the inner corners trimmed, allowing the vertical check of the cross piece to fit tightly against the posts. The height of the trellis is 6 feet. Twelve feet is allowed

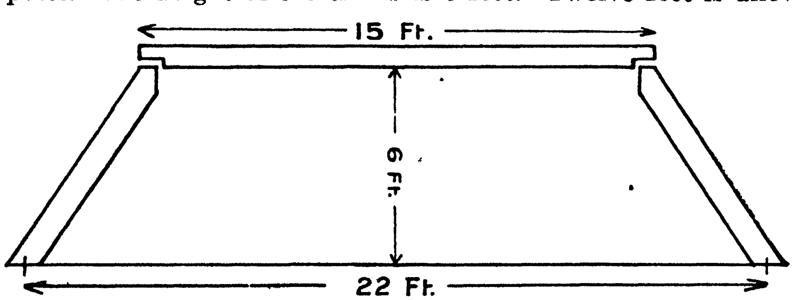


Plate 82.

SHOWING THE CONSTRUCTION OF TRELLIS DESCRIBED IN FIRST METHOD.

between posts on each side of the trellis, and the end posts should be well stayed. Wire of 12½ gauge is stretched along the trellis and attached firmly to the posts at intervals of approximately 15 inches.

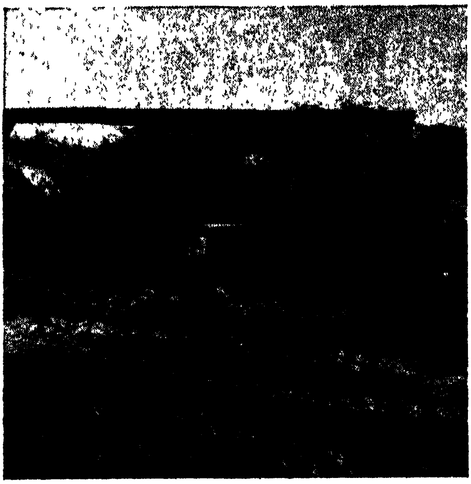


Plate 83.

VINES ON TRELLIS BUILT BY FIRST METHOD, AND SHOWING IRRIGATION LINE.

In the second method (see Plate 84) two rows of strong posts are set vertically in the ground, with a height of about 6 feet, the rows being about 10 feet apart, and the posts about 9 feet apart in the rows. The tops of the posts support cross timbers on which 12½-gauge plain wire is stretched, allowing 15 inches to 18 inches between the wires. Stays support the posts, and wires are also stretched on these.

Planting.

The entire choko fruit is used for planting. Each fruit bears only one seed, which is situated in the base of the fruit. Plants are set approximately 12 feet apart along the trellis. Towards the spring, or at almost any time during the warm weather, provided the fruit has reached maturity, the seed will break into growth. When all danger of frosts is past planting may be done. It should be carried out as early as possible in order to allow the plant sufficient growing time during the warm weather to establish itself thoroughly for the succeeding season. Late planting is sometimes unavoidable; in this case no crop may be harvested the first season but the plants will be partly established for the next season.

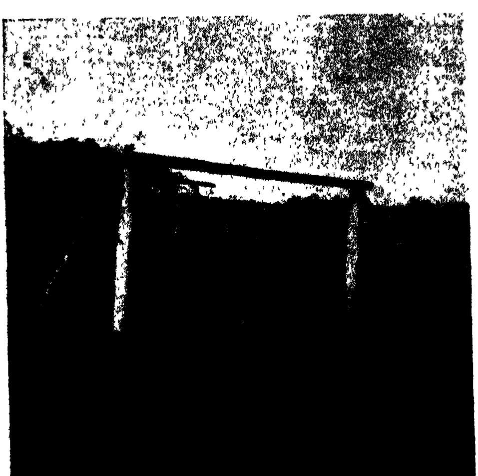


Plate 84.

SHOWING TRELLIS BUILT TO SPECIFICATIONS OF THE SECOND METHOD.

As long as the seed has started to shoot the fruit is ready for planting, and the usual practice is to place the fruit on its side at an angle of about 45 deg., with the shoot downwards, so that the shoot is about 3 inches to 4 inches below the surface and the narrow end at ground level, or slightly exposed.

The green variety is the more popular market type, but the cream variety is sometimes favoured by home gardeners.

Plate 85.
HEALTHY WELL-SHAPED FRUIT READY FOR PLANTING.

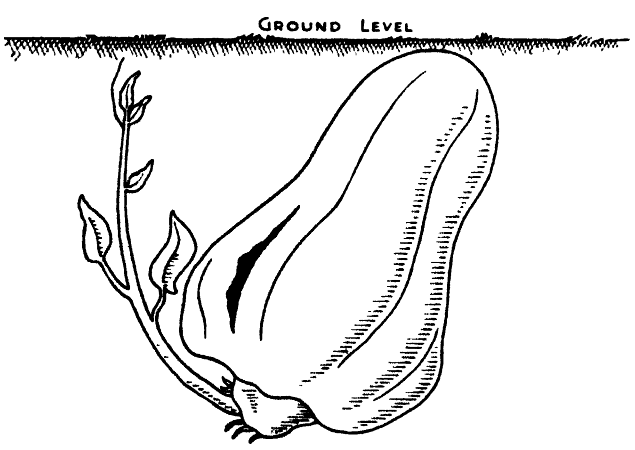


Plate 86.
SHOWING METHOD OF PLANTING.

Cropping.

Under good growing conditions the plants establish themselves in a short time, and grow rapidly. With early planting a crop may be harvested during March and April. The following season an early crop will probably set, and will be fit for market during November and December, with the main crop again appearing in March and April. Fruit may be harvested in between the two crops, but in smaller quantities. It is this feature which makes the choko an ideal plant for the home gardener, as it is very rarely during the greater portion of the year that there are not a few fruit ready for picking. Early crops in some instances are not big, and it is necessary that the plants be plentifully supplied with both food and water when they start into growth to obtain any quantity of fruit at this stage.

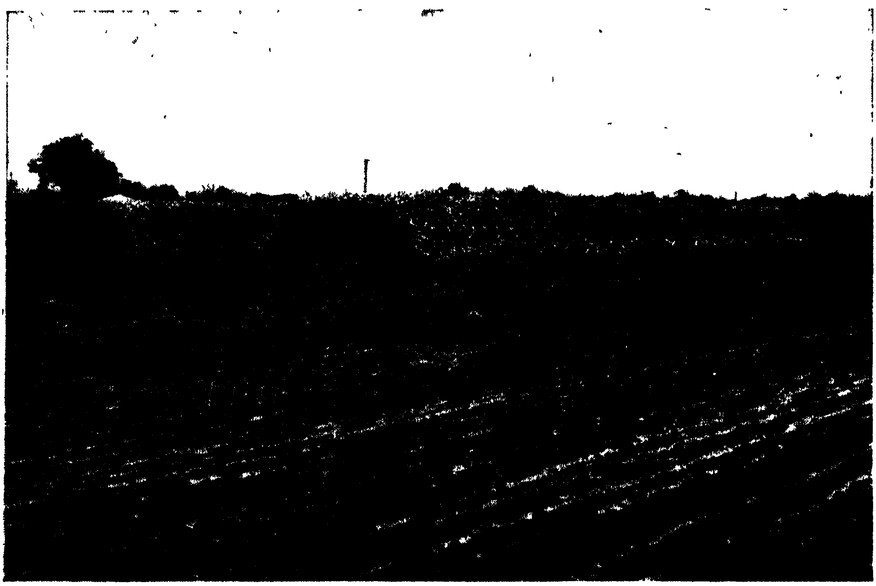


Plate 87.

TWO STRONGLY-CONSTRUCTED BOWERS SUPPORTING HEALTHY VINES.—
Note spread of vines between trellises.

Fertilizing and Manuring.

Although it may appear that this vegetable requires a minimum amount of attention to grow satisfactorily, this is far from true. A successfully grown choko will produce an abundance of growth and fruit, and in doing so its food requirements are particularly heavy. Farmyard manures appear to be most satisfactory, and *should be applied in the early spring prior to growth.* As the choko grows very rapidly any subsequent applications of manures are máde somewhat difficult unless spread under the trellis. It is therefore recommended that a heavy application of either fertilizer or manure be made in the spring. The initial dressing may be supplemented by later topdressings of fertilizer or manure broadcast around the plants *under* the trellis. It is a common practice even with the spring dressings to place a certain

amount under the trellis. As a substitute for farmyard manure, meatworks fertilizer may be used, or a complete fertilizer containing a good proportion of meatworks manure. The fertilizer should be applied similarly to and at the same time as recommended for farmyard manure. Topdressing under the trellis and adjacent to the plants with a quick-acting fertilizer high in nitrogen is recommended where the base dressings are of meatworks manure or mixtures containing it. Two topdressings may be made during the season, but one should coincide with the time the main crop is setting during midsummer.

Eight to ten pounds of fertilizer per plant as a spring dressing when the plants are established should be sufficient, with topdressings of 2 to 3 lb. per plant.

Plate 88.

FULLY DEVELOPED MEDIUM-SIZED FRUIT READY FOR MARKET.

Irrigation.

A constant and copious supply of water is essential for good growth, and at no stage must the plants be allowed to lack moisture. Many of the bowers are planned so that a permanent irrigation line is set up under the trellis (see Plate 83). Thorough soakings are required. When the plants are in full growth and cover the trellises and the ground beneath, the dense foliage tends to lessen evaporation, so that it is not difficult to keep the soil in a moist condition.

Harvesting.

Chokos should be harvested when they are fully developed. They may vary in size according to type and growing conditions. They should not be allowed to become too old, but must be picked prior to seed development. They may be marketed loose or packed in clean corn sacks or cases. An average crop from a good healthy bower should be in the vicinity of 600-700 dozen per chain or about 60-70 dozen per plant.

Control of Army Worms.

J. A. WEDDELL, Entomologist, Science Branch.

REPORTS of swarms of caterpillars have come in this spring from various parts of the Darling Downs. These caterpillars are usually called army worms because of their congregating and migrating habits. Infestations of this kind usually start in grasslands and the army worms are liable in the course of their movements to invade and damage standing crops. Usually when the army worms are on the move they form a fairly well defined "front." Even after they have entered a crop and have become somewhat dispersed the limits of the infestation can be easily found. Occasionally infestations by this type of insect are somewhat general over an area and there is no definite "front."

The standard and well tested method of control of this type of infestation consists in the scattering of a poison bran bait along the line of the front and for a strip a few feet wide in advance of it.

Preparation of Bait.

In a large tub or other suitable container, thoroughly mix 1 lb. Paris green into 25 lb. dry bran. In another smaller vessel mix 1 qt. molasses into 2 gallons water. Pour the sweetened solution on the poisoned bran and then mix the whole thoroughly to a uniformly moist loose mash. By mixing the bait in this way and to these proportions the finished material should be in a moist, crumbly condition and each flake of bran should carry its small proportion of the poison.

Distribution of Bait.

The bait should be distributed by broadcasting it as is done in the hand sowing of grain. In grassland the operator should walk along the front line of army worms and cast the bait in a wide scatter, partly over the caterpillars but mainly in advance of them. When the army worms are invading or are liable to invade standing crops particular atention should be given to the headlands. The bait can also be broadcast in the standing crop over an area including and slightly beyond the limits of infestation.

If the army worm infestation is of the less usual scattered type and not clearly defined, then the bait may need to be scattered over a fairly wide area; but particular attention should still be paid to margins so as to prevent the formation of a "front," particularly in the vicinity of crops.

DDT an Alternative.

Although as already stated the use of bran baits is the standard method of control of army worms, the newer insecticide DDT has been used against this type of pest with good results. Hence, should there be any difficulty in obtaining baiting materials, a DDT spray at a strength of 0·1 per cent. DDT may be used, or DDT dusts may be applied.

Black Aphids Invade South-eastern Queensland.

J. A. WEDDELL, Entomologist, Science Branch.

OVER a very wide area of south-eastern Queensland swarms of winged black aphids occurred this spring. At first, they were reported in only a few places but gradually they became more general and they finally infested a range of at least 50 miles north and south of Brisbane, and extended from the coastline back to the eastern Darling Downs. In fact, reports from the Darling Downs area indicated that the source of the infestation was probably still further west and that the winged aphids had been air-borne on the westerly winds.

The insect is know scientifically as *Aphis leguminosae* and as its name implies it is generally associated with legumes—that is, plants of the pea and bean family. The insect is fairly common but it is not usually outstanding in any way among the many pest aphids. A check of records of possible food plants of the insect, both here and in other parts of the world, shows that at least 60 different food plants have been listed, including many species of both weeds and cultivated plants. The list includes many that are not legumes.

During the first few days of the spring invasion the insects were seen to be present on various cultivated crops, but there was no indication that they were doing anything other than resting. It was later shown that they were feeding and breeding, particularly on beans and related plants, but also to some extent on tomatoes, cucumbers, pumpkins and other vegetable crops, to a degree sufficient to cause both damage and temporary concern.

Control Measures.

Recommended control measures for this pest are as follows:—

On crops other than tomatoes, a spray containing hexaethyl tetraphosphate (HETP) should be used. This should be carefully mixed at the strength recommended by the manufacturer, with the addition of a wetting agent. The HETP must be measured accurately and applied immediately it is mixed.

On tomatoes, HETP should not be used. In the case of this crop the only satisfactory spray is nicotine sulphate, and every endeavour should be made to obtain this material even though it is in short supply. The nicotine spray for tomatoes should be mixed at the following rate:—1 fluid ounce nicotine sulphate, 3 ounces soap, 5 gallons water.

Repeat treatments are required as occasion demands, for reinfestation of the plants occurs while the insects are prevalent.

Outline of Departmental Services.

THE Queensland Department of Agriculture and Stock is a State Department administered by the Minister for Agriculture and Stock. The Department is charged with the prosecution of a wide range of activities relating to the improvement of agriculture and stock-raising in Queensland. Funds for its general activities are voted by Parliament each year, while certain special activities are financed from trust funds provided by voluntary contributions from producers' organisations or by special levies and supported by direct vote of Parliament.

Organisation of the Department.

The Department has as its permanent head an Under Secretary, who is assisted in administration work by a technical Assistant Under Secretary co-ordinating the activities of the three "production" Divisions—Plant Industry, Animal Industry and Dairying—and a second Assistant Under Secretary who oversees the functioning of the Division of Marketing and handles general administrative matters.

Branches attached to the Central Administration are Accounts, Commercial and Despatch, Records and Information. The Information Branch is responsible for publishing the *Queensland Agricultural Journal*, the *Queensland Journal of Agricultural Science* and pamphlet material, for photographic services, for radio broadcasts, &c., and also maintains a large Central Library for the use of Departmental officers.

Division of Plant Industry.

All aspects of crop production come within the province of the Division of Plant Industry, which consists of seven Branches—Administrative and General, Agriculture, Horticulture, Regional Experiment Stations, Sugar Experiment Stations, Science and Chemical Laboratory.

Administrative and General Branch.

Apart from broad administration, this Branch includes one service of particular interest to landholders of all types—the Soil Conservation service. This general service covers conservation aspects of all forms of agriculture and horticulture. It has a staff of specialists engaged on research and advisory work. To facilitate the instruction of landholders in various methods of soil conservation, Demonstration Areas have been established in many shires. Soil conservationists are stationed at Brisbane, Toowoomba and Kingaroy and may be consulted at those centres. Farmers in other centres may find it advantageous to consult their local agricultural or horticultural officer in the first instance.

Agriculture Branch.

The Agriculture Branch, which is under the control of the Director of Agriculture, conducts field investigations into various problems of crop (other than sugar cane) and pasture production, including soils and fertilizers, methods of cultivation, varieties, irrigation, &c. A plant-breeding section undertakes the improvement, by selection and breeding, of the major field crops. The Branch conducts the Bureau of Tropical

Agriculture at South Johnstone as a testing station for tropical pasture plants and various tropical crops. It has also tobacco experiment farms at Mareeba, Ingham and Ayr.

Advisory officers in agriculture are stationed in most of the important agricultural districts. In addition to providing an advisory service for farmers, these officers co-operate with the research staff in arranging and conducting farm experiments on crops and pastures.

Horticulture Branch.

The Horticulture Branch, directed by the Director of Horticulture, has, like the Agriculture Branch, both research and advisory sections, but in addition it administers the Fruit and Vegetables Act, the Diseases in Plants Acts and the Banana Industry Protection Act.

Horticultural research work is concerned with production problems, selection and breeding work, transport and storage, and maturity standards. Special research stations are located at Nambour, Ormiston and Kamerunga and there are laboratories in Brisbane. Elsewhere, research work is conducted in private orchards and market gardens.

The field advisory staff assists in research work but is concerned primarily with advising fruit- and vegetable-growers on improved methods of production. Packing instruction is also given as a field service.

Inspectors under the various Acts are stationed in producing and unloading centres to maintain standards of fruit and vegetables offered for sale, to prevent the spread of disease and for other special purposes.

Regional Experiment Stations.

Experiment Stations operated for the benefit of all production Branches of the Department are known officially as Regional Experiment Stations. Their purpose is to investigate crop, pasture and livestock production problems in the various regions, and especially to integrate crop and livestock production. Regional stations are located at Kairi (Atherton Tableland), Ayr, Biloela (Dawson Valley) and Hermitage (Darling Downs).

Bureau of Sugar Experiment Stations.

The sugar industry is serviced by a Branch of the Division of Plant Industry with laboratories in Brisbane, experiment stations at Meringa, Ayr, Mackay and Bundaberg and field advisory officers throughout the sugar-producing districts. All aspects of cane production and sugar milling are covered by this service.

Science Branch.

While certain scientific activities are undertaken by the Agriculture, Horticulture and Regional Experiment Stations Branches themselves, others are provided by the Science Branch, which has sections of entomology, plant pathology and botany. The entomologists and plant pathologists investigate the causes and control of insect and disease troubles of crops and provide an advisory service on these matters. The botany section identifies and reports on weeds, fodders and economic plants generally and conducts research into western pastures.

The Science Branch also embraces the apiary and fauna protection services.

Chemical Laboratory.

The Chemical Laboratory provides analytical services (for example, soils, waters, insecticides, dip mixtures, &c.) for various other branches of the Department and for landowners. It investigates the chemical aspects of plant toxicity and health of crops and livestock.

Division of Animal Industry.

This Division covers all forms of livestock production (excluding bees), diseases of stock and registration of brands. It consists of six branches—Veterinary Services and Acts Administration, Animal Health Stations, Sheep and Wool, Cattle Husbandry, Pig and Poultry.

Veterinary Services and Acts Administration.

Under the Chief Inspector of Stock there are a number of Divisional Veterinary Officers who perform certain veterinary services and supervise the various veterinary officers, stock inspectors and slaughtering inspectors in their districts. The inspectional services are concerned mainly with controlling the spread of livestock pests and diseases and in ensuring a wholesome meat supply. The main concern of the veterinary officers is the reduction of diseases such as tuberculosis, brucellosis and mastitis. Ordinary surgical and medication work is not usually undertaken for farmers, this being in the province of the private practitioner.

Animal Health Stations.

The Division's Director of Research is responsible for the two Animal Health Stations—at Yeerongpilly (near Brisbane) and Oonoonba (near Townsville)—which do general diagnostic and research work on animal health problems, investigate the control of parasites and provide an immunization service against tick fever in cattle.

Sheep and Wool Branch.

Field advisory officers are stationed in the chief wool-growing and sheep-raising districts to provide information and instruction on flock and property management, breeding, feeding, lamb-raising, pest and disease control, &c. The field officers also co-operate in research investigations.

Cattle Husbandry Branch.

The Cattle Husbandry Branch is responsible for matters pertaining to cattle husbandry and production in both the beef and dairying industries. Educational activities in breeding, feeding and management of cattle are undertaken and investigational work conducted.

Pig Branch.

The Pig Branch has officers at various centres to advise growers on breeding, housing, feeding and rearing of pigs and in particular to keep them informed on the best practices to adopt in producing the requirements of the market for the time being.

Poultry Branch.

This Branch is responsible for all phases of poultry production and a staff of advisers and inspectors is continuously visiting poultry farmers to advise on correct methods of production, to blood test for pullorum disease and to assist growers in reducing losses from diseases generally.

Division of Dairying.

The principal function of the Division of Dairying is to improve the quality of dairy products and to increase the efficiency of dairy production in Queensland. The approach is through research into dairy products, herd recording, field instruction of dairy farmers on improved methods of milk production, and services to factories.

Dairy Research Branch.

This Branch has laboratories at Brisbane and Toowoomba and a sub-laboratory at the Hamilton Cold Stores.

Its research work covers quality of market milk, problems of butter texture and quality, cheese manufacture, and surveys of milking techniques and the efficiency of dairy farm practices.

Routine work on the control of quality of dairy produce has several phases. Market milk is examined at depots and in the laboratory and unsatisfactory supplies are traced back to the farms where the source of the trouble is located. Causes of inferior butter are determined by chemical and bacteriological examinations.

The Branch provides an advisory service on engineering problems and on water treatment, water disposal, farm refrigeration and farm cooling.

Field Branch.

Herd recording, or the testing of the individual cows of a herd for milk and butterfat production, is carried out by a special section of the Field Branch.

Advisers in the main districts deal with matters affecting butter and cheese quality, while Dairy Officers supplement the advisory service on farms and also carry out inspectional work under the Dairy Produce Acts, insofar as farm production is concerned.

Division of Marketing.

The Division of Marketing is concerned with the operations of the numerous commodity marketing boards and other producers' organizations operating on a non-marketing basis. The Division provides the Government representatives on the boards.

The Division provides a crop-forecasting service, issues a regular production-trends bulletin, and operates a market-price reporting service for various agricultural commodities.

Within the Division is a Standards Branch, whose concern is the drawing up of standards for various farm requirements and the policing of those standards. The service applies to fertilizers, pest destroyers, stock foods, veterinary medicines and seed for sowing. In addition, a seed-testing service is provided for farmers and merchants, and various seed production schemes are supervised. Rationing of fertilizers and other products as necessary is also controlled by the Branch.

Lumpy Wool of Sheep.

G. R. MOULE, Officer in Charge, Sheep and Wool Branch.

IT has become obvious that "lumpy wool" is a fairly common disease of sheep in Queensland. It occurs in most pastoral districts, but during the past year it has been particularly prevalent in the southern part of the State, where favourable seasonal conditions have prevailed.

Lumpy wool is a condition which may affect sheep of any age and in lambs it may appear within a few days of birth.

Cause.

Lumpy wool is caused by a specific organism which inhabits the soil of sheepyards and camps. In wet seasons, when the skin is slightly scalded, the organisms enter the hair or wool follicles and set up marked inflammation with a resulting deposition of a tough, horny scab.

Symptoms.

The back and sides of sheep are most commonly affected and three definite stages of the disease can be recognised:—

(1) Initial inflammation, with thickening of the skin and some weeping.

(2) A period of crust formation, which commences within about a fortnight. The scabs, which are yellowish in colour and are roughly circular, form initially on the surface of the skin. The scabs become thickened with the addition of more material from underneath, until they are characteristically pyramidal in shape, with the base of the pyramid on the skin. The wool fibres are bound together by the scabs, which gradually become drier and horn-like in appearance, though they are more friable and tend to be flaky at the edge. Development up to this stage takes several weeks. Often there is no visible external sign that sheep are affected, but as soon as the animals are handled the scabs can be readily felt. On parting the wool, the scabs, which may be up to one inch in thickness, are seen matting the wool fibres together and adhering to the skin.

(3) The third stage of the disease includes the separation of the scabs from the skin, which occurs after they have reached certain development or when dry weather occurs. If only a small area of skin has been affected and if it is not seriously damaged the wool fibres link the scab to the skin.

Suppuration may occur under large scabs and this is accompanied by ulceration of the skin and sometimes the scab is attached only at its edges.

When lumpy wool affects lambs soon after birth the first indications include a gumminess of the whole of the back and sides. In a few days this dries and forms a tough scab-like layer which is quite firmly attached to the skin. Breaks, which have the appearance of cracks in a coat of varnish, then appear and the scabs become somewhat thicker, so that they now reach about ⅛-inch or more above the level of the wool.

More recent observations have revealed that the organism which causes lumpy wool often invades the hairy parts of the face and ears. When this occurs, a low, flat, amber-brown scab develops and it may spread over quite extensive parts of the muzzle or the ears.

Treatment.

Usually only a few animals in any one flock are affected and treatment is easily carried out by shearing them on a temporary board or an old pack. The affected wool should be burnt and the sore skin dressed with a solution of bluestone containing about ½ lb. bluestone to one gallon of water.

Distribution of Sheep in Queensland.

The Queensland Government Statistician recently released figures for livestock numbers in the various Statistical Divisions and shires of the State as at 31st March, 1948.

The figures for sheep (in each case to the nearest thousand) are as follows:—

Moreton Division	3,000
Maryborough Division	1,000
Downs Division	2,235,000
Allora	1,000
Cambooya	4,000
Chinchilla	20,000
Clifton	13,000
Glengallan	13,000
Inglewood	272,000
Jondaryan	36,000
Millmerran	102,000
Murilla	31,000
Pittsworth	26,000
Rosalie	2,000
Rosenthal	73,000
Stanthorpe	153,000
Tara	500,000
Waggamba	916,000
Wambo	76,000
Other Shires	1,000
Roma Division	2,699,000
Balonne	1,376,000
Bendemere	26,000
Booringa	409,000
Bungil	358,000
Warroo	532,000
South-western Division	2,936,000
Bulloo	150,000
Murweh	928,000
Paroo	1,011,000
Quilpie	847,000
Rockhampton Division	39,000
Central-western Division	3,803,000
Aramac	775,000
Barcaldine	346,000
Bauhinia	99,000
Belyando	102,000
Blackall	654,000
Emerald	108,000
Ilfracombe	244,000
Jericho	135,000
Longreach	843,000
Peak Downs	148,000
Tambo	349,000
Far-western Division	2,014,000
Barcoo	363,000
Boulia	380,000
Diamantina	Nil
Isisford	316,000
Winton	955,000
Peninsula, Cairns, Townsville and Mackay Divisions	2,000
North-western Division	3,011,000
Cloncurry	315,000
Flinders	1,032,000
McKinlay	920,000
Wyangarie	744,000
Other Shires	Nil

Feeding the Dairy Cow.

R. D. CHESTER, Officer in Charge, Cattle Husbandry Branch.

THOUGH Queensland is one of the leading dairying States in the Commonwealth and has a greater exportable surplus of butter than any other State, it has reached this position because of certain inherent advantages of soil fertility and climate rather than by any special effort on the part of the bulk of producers. The average production per cow in Queensland is in the vicinity of 120 lb. of butterfat per annum, or approximately one-third of a pound per day. This is the lowest for all States. It should be possible to double this production by better methods of husbandry.

On many farms there is room for vast improvement in general farm management, in breeding methods and in the feeding of dairy cattle.

It is necessary not to lose sight of the possibilities of improved breeding methods. The maximum potential milk production of any cow is fixed by factors inherited from her sire and dam. Should this potential maximum be low, good feeding cannot convert such a cow into a high producer. By the wise use of herd recording, these animals can be detected, eliminated from the herd and replaced by calves from high-producing cows served by proven bulls. It is necessary that, when purchasing a bull, the farmer should pay a little less attention to the show-ring achievements of the parents and a great deal more attention to the production of the herd from which the bull is to be drawn. However, breed improvement, though essential to real progress, is for obvious reasons a slow method of improving the overall production of herds. On the other hand, much can be accomplished in a very short time by improved feeding methods.

Wiser pasture management and controlled grazing, together with supplementary feeding with green crops, dry roughages or concentrates, are the keys to immediate improvement in dairy production.

For the farmer the economic aspect of supplementary feeding is of the utmost importance. Obviously, it is only sound to feed if the

increased annual output resulting from the use of supplementary feeds is worth more in pounds, shillings and pence than the cost of buying or producing the supplements.

Cows may respond with relatively large outputs to small amounts of supplementary feed; but the milk output may not be so great in comparison with the feed intake when the amount of supplement is increased. It is obvious, therefore, that there is a best (or "optimum") level at which to feed supplements. This level will vary, depending on the nutritive state of the pastures, the cost of supplements and the price of milk. To obtain best results each farmer must attempt to feed supplements at a level approaching this optimum. To do this, he must have a good working knowledge of the various foods and of the requirements of the cow.

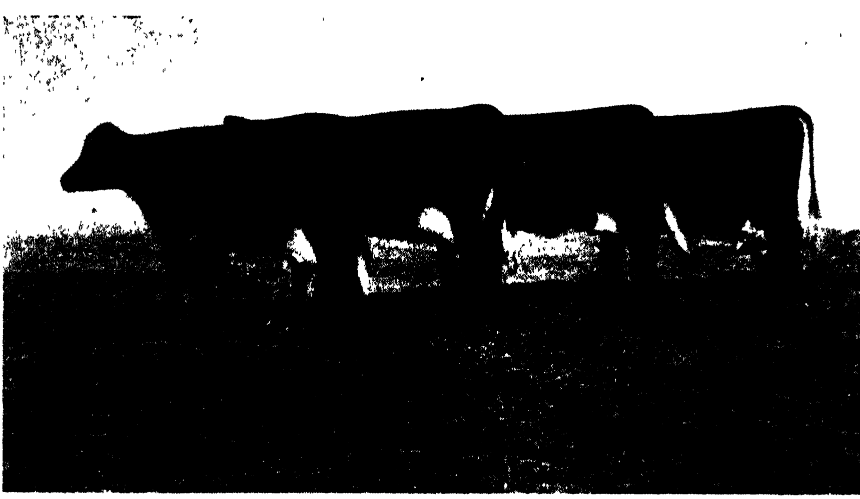


Plate 89.

A BALANCED RATION IS ESSENTIAL FOR MAXIMUM PRODUCTION.—These milking-test winners have the capacity to respond to good feeding.

THE COMPOSITION OF FOODS.

All stock foods are made up of dry matter and water. The percentage of water in any fodder has an important effect on its physical structure and may alter the palatability. If a fodder is excessively succulent (that is, contains a large excess of water), it may be physically impossible for the animal to consume enough for normal requirements. On the other hand, insufficient succulence, particularly in hays, may lead to a dusty condition whereby much valuable food material is unavailable to the animal.

Cattle on fodders containing a high percentage of water will obviously require less drinking water than those on dry food.

In estimating the bulk of food required by a beast, only the dry-matter content of the particular fodders is taken into consideration.

The dry matter in the food is composed of a number of constituents of chemically distinct make-up. The chief of these are carbohydrates, fats, fibre, protein, minerals and vitamins.

Each chemical group has its special part to play in the overall nutrition of the animal. Absence or deficiency of any one group is likely to affect the utilization of others.

Carbohydrates and Fats.

Carbohydrates and fats form the bulk of the food. They are the energy-producing constituents, supplying (1) energy for movement, (2) heat to maintain normal body temperature, and (3) the body fats, which are used, in part, to cushion the effect of external stimuli on more delicate tissues or organs and more particularly as a store of energy to be drawn on in periods of low food intake.

Fats and carbohydrates in the diet are responsible for the formation of butterfat and milk sugar (lactose) in the milk of dairy cows.

Fats, on a pound-for-pound basis, are about twice as rich in energy as are the carbohydrates. This accounts for the high energy value of foodstuffs, such as the oilmeals, which contain relatively high proportions of fat.

Carbohydrates and fats cannot be converted into protein by the animal body. They cannot, therefore, replace protein in the diet.

Although the main function of fat in animal nutrition is that of an energy food, it has been shown that fat cannot be wholly replaced by carbohydrate in the diet. If the quantity of total fat in the ration is reduced below a certain minimum, the milk yield will fall even though the energy requirements of the animal are met. It is interesting to note that American work indicates that a low-fat diet reduces milk yield without affecting fat percentage in the milk. The workers concerned suggest that the diet should contain more than 70 per cent. of the total fat secreted in the milk. The ration should contain at least 4 per cent. of fat.

Fibre.

This is the coarse, indigestible portion of the plant which is responsible for its shape and rigidity. Plants normally develop a higher fibre content with increasing age. For instance, young green oats is low in fibre (4 per cent.), whereas oaten straw contains a high proportion of fibre (35 per cent.).

Generally fibre is not utilized to any extent by the animal, but in the case of cattle and other ruminants some fibre is broken down by bacterial action in the rumen or paunch and thereby fibre does play some part in supplying the energy requirements of the beast.

Fibre has the important function of adding bulk to the food. It fills the stomach and intestines, thus assisting normal physiological activity and facilitating better action of the digestive juices and more efficient absorption and elimination of food material and waste products. It is also necessary to stimulate normal rumination. Feeds of low fibre content frequently cause cessation of rumination with resultant bloat and impaction.

Protein.

Proteins are complex chemical groups made up by a combination of varying numbers of substances called amino acids. The particular amino acids concerned in the formation of various proteins are of importance since, in most animals, they cannot be manufactured within the body. As they are essential to the well-being of the body, it is important that proteins which contain them should be supplied in the feed. Thus proteins which contain a number of different amino acids are frequently said to be of high biological value while those proteins containing few different amino acids are of low biological value.

Plate 90.

LUCERNE HAY IS A HIGH-PROTEIN ROUGHAGE.—The only concentrate required to balance a ration of lucerne is grain containing 10 per cent. protein. The hay bales shown in this picture are being used as the wall of a silo.

However, the biological value of proteins is of less importance in the nutrition of ruminants than in the case of other animals, as the bacterial action of the rumen does account for the synthesis or manufacture of at least some amino acids. Thus, when feeding dairy cows, it is not necessary to include animal protein. There is an indication, however, that calves reared on a minimum amount of milk thrive better if some animal protein such as meatmeal, blood meal or dried milk is included in the calf's diet, since the rumen of a calf is not sufficiently developed to be capable of the same amino-acid production as that of a mature beast.

Proteins are essentially body building materials. They are responsible for the growth of muscle and the production of milk. Milking cows and growing stock require a relatively high proportion of protein

in the ration. Mature store stock and fattening cattle will thrive on diets lower in protein. Under Queensland conditions, the deficiency of protein in natural pastures is most frequently the limiting factor to milk production, and this low protein intake, more than any other single factor, is probably responsible for Queensland having the lowest average production of any State in the Commonwealth. If it were possible to supply adequate protein, the State production might well be doubled.

When protein is present in excess in the diet, the animal is capable of using the protein for the production of energy. It is wasteful and economically unsound, however, to feed excess of purchased protein concentrates.

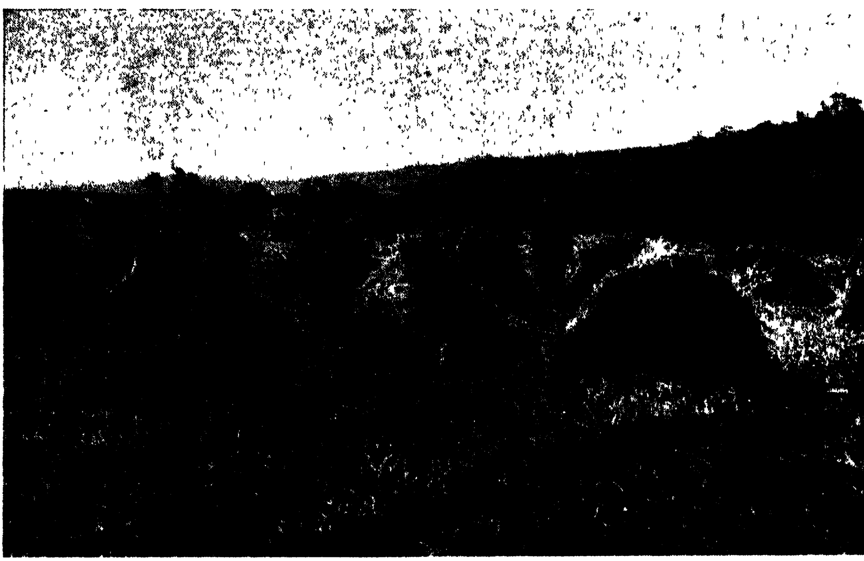


Plate 91.

CEREAL HAY IS A LOW-PROTEIN ROUGHAGE.—A concentrate mixture of grains and protein-rich meal, with a total protein content of 20 per cent., is required to balance a ration of cereal roughage.

Minerals.

Minerals are essential for normal growth and development—that is, for the formation of bone, blood and other body tissues. There is quite a long list of minerals essential to the well-being of the animal, but in Queensland, phosphates, lime and salt are the only ones of general importance. Of these, the deficiency of phosphates causes the greatest economic loss. Many of the soils in the dairying areas of the State are deficient in phosphates, with the result that pastures are also deficient. In many districts, because of the chemical nature of the soil, pastures do not respond to top-dressing with superphosphate, and it is therefore necessary to feed licks of bone-flour.

Salt and lime deficiencies are not likely to occur under grazing conditions except in times of drought. Where cattle are heavily stall-fed, however, it will frequently be necessary to add supplements of salt and finely ground limestone.

Vitamins.

Cattle are less likely to be affected by vitamin deficiency than most other animals, since the ruminant can manufacture many of the vitamins in the rumen.

Vitamin A, however, is essential to the well-being of cattle. It is of particular importance to the growing calf and lack of this vitamin is probably, at least partly, responsible for a great deal of the loss due to scours and pneumonia of calves in this State.

Adult cattle can store a good deal of vitamin A to carry them over dry periods, and provided a reasonable amount of green feed is available to cattle from time to time during the year there is little fear that they will suffer from deficiency during relatively short periods of scarcity.

Plate 92.

Modern Ensiling Machinery makes it Possible to Conserve a Crop with the Maximum Degree of Safety and a Minimum Expenditure of Labour.—Silage may replace hay in the ration at the rate of three pounds of silage to one pound of hay.

CLASSIFICATION OF FODDERS.

Fodders are usually classified according to the amount of fibre they contain and again according to their percentage of digestible protein.

The first broad classification is into roughages and concentrates.

Roughages are those foods, such as silage, hay and mature pastures, which contain a relatively low percentage of energy food.

Concentrates are those foods, such as grains and the various meals and young actively-growing pastures and crops, which have high starch-equivalent values.

The capacity of various animal foodstuffs to fatten cattle was first assessed by Kellner, a German animal nutritionist. In order to have some unit with which all feeds could be compared, he took starch and related all other feeds back to this unit. For instance, if he found that it took 100 lb. of wheat to produce the same liveweight gain in a bullock as was produced by 72 lb. of starch, he gave wheat a starch-equivalent value of 72, and so on with other foodstuffs. Since the time of Kellner, many other workers have continued checking his figures and working out starch-equivalent values for other foods and today tables are available showing the starch equivalents of most cattle fodders.

There is no sharp dividing line between the roughages and concentrates. In intermediate positions, between the two extremes, there are such important fodders as mill offals and well balanced feeds such as green crops and pasture. However, when estimating rations it is convenient to consider most fodders as either roughages or concentrates, and perhaps the simplest method of rationing is to adjust the type of concentrate fed according to the cheapest source of roughage available.

Both roughages and concentrates, in their turn, can be divided into protein-rich and non-protein-rich groups. This is a convenient grouping for rationing purposes in that protein-rich roughage can be balanced with non-protein-rich concentrates, and so on; so that, provided this simple classification is committed to memory, it is possible to make a reasonable attempt at balancing a ration without resource to involved calculations.

TABLE 1.

FODDER VALUES OF COMMONLY USED ROUGHAGES.

—	Moisture Content.	Food Units. (Starch Equivalent).	Digestible Crude Protein.
	Per cent.	Per 100 Lb.	Per 100 Lb.
Green Feeds.			
Lucerne	80	12	4·0
Cowpeas	80	12	3·0
Cereal Crops	85	14	1·5
Sudan Grass	80	12	1·5
Millet	80	14	1·3
Maize	80	12	1·0
Saccaline Sorghum	80	12	1·0
Cow Cane	75	14	0·8
Pumpkin	85	12	1·0
Silage.			
Cowpeas	80	12	2·0
Sorghum	75	12	1·0
Maize	75	12	1·0
Hay.			
Lucerne	10	35	12·0
Cowpeas	10	35	10·0
Cereal	8	35	2·0

In Tables 1 and 2 the commonly used dairy fodders have been set out in their various groups and average starch-equivalent values and digestible crude protein contents listed.

These approximate values have been given in order that they may be committed to memory, and for purposes of most feeding calculations they will prove sufficiently accurate. However, for detailed work accurately compiled tables should be consulted. The most convenient tables for general purposes are those in Bulletin 124 of the Ministry for Agriculture and Fisheries of Great Britain entitled "The Composition and Nutritive Value of Feeding Stuffs."

Plate 93.

PASTURE IS THE CHEAPEST FORM OF FOOD FOR DAIRY COWS.—Full use should be made of any available pastures. Pastures are of greatest value while growing actively. Ensure even grazing by the use of small paddocks and rotation of stock.

TABLE 2.

FODDER VALUES OF COMMONLY USED CONCENTRATES.

—	Food Units (Starch Equivalent).	Digestible Crude Protein.
	Per 100 Lb.	Per 100 Lb.
Protein-rich Concentrates.		
Blood Meal	60-70	65-70
Meatmeal	75-80	53-55
Peanut Meal	75-80	40-45
Cottonseed Meal	65-70	30-35
Linseed Meal	68-72	25
Maize Gluten Feed	70-75	20
Carbohydrate-rich Concentrates.		
Maize grain	77	8
Wheat grain	72	8
Oat grain	61	8
Sorghum grain	76	7
Bran	56	10
Pollard	66	10
Molasses	50	0

Plate 94.

GREEN OATS IS WELL-BALANCED FEED FOR DAIRY COWS.—It is wise to feed a little roughage either as dry pasture or hay to cows on green oats.

THE FOOD REQUIREMENTS OF THE COW.

In order to assess a balanced ration for any individual cow, the following information is required:—

1. Liveweight of the cow.
2. Pounds of milk produced per day.
3. Butterfat content of the milk.

The liveweight of the cow determines her capacity for daily food intake.

It is convenient to estimate that a cow of 1,000 lb. liveweight will eat approximately 30 lb. of dry matter per day. For every 100 lb. above or below 1,000 lb. liveweight, add or subtract 2 lb. of dry matter from the ration.

TABLE 3.

Liveweight of Cow.	Dry Matter Required per Day.
Lb.	Lb.
700	24
800	26
900	28
1,000	30
1,100	32
1,200	34
1,300	36

There will be some variation from this table. Dry cows and beef cattle will probably eat somewhat less in proportion to their weight. Heavy milkers will frequently eat more than the average cow.

The nature of the ration, too, will have an effect upon the amount of food a cow will eat. On a heavy unpalatable ration, the appetite is reduced. On a highly palatable ration, containing a variety of foodstuffs, the cow will eat a greater bulk of feed.

However, the figures given are sufficiently accurate for the practical purpose of rationing a herd.

The liveweight also determines the starch equivalent and digestible protein required to maintain the body at normal weight.

In practice, the usual trend with a good milk producer is to lose weight for the first two to three months after calving, even when fed for her full milking capacity. After the first few months, she will gradually build up again in preparation for the next lactation period.

It is sufficiently accurate to estimate the maintenance requirements of a 1,000-lb. cow at 6 lb. starch equivalent and 0·6 lb. digestible protein and to add or subtract 0·5 lb. starch equivalent and 0·05 lb. digestible protein for every 125 lb. increase or decrease in the liveweight of the cow.

TABLE 4.

MAINTENANCE REQUIREMENTS.

Liveweight of Cow. Lb.	Food Units (Lb. Starch Equivalent.)	Lb. Digestible Protein.
750	5·00	0·50
875	5·50	0·55
1,000	6·00	0·60
1,125	6·50	0·65
1,250	7·00	0·70

The maintenance requirements will vary fairly widely according to the nature of the country on which cattle are held and according to the availability of fodder.

Table 4 gives maintenance requirements for cattle stall-fed or on adequate pasture. Maintenance requirement will increase if cattle are pastured on rough country, if they have to walk long distances to water, or if grazing is scarce and they have to graze over large areas in order to obtain sufficient nutrients. Therefore, in estimating rations it may frequently be necessary to add one or, at times, even 2 lb. of starch equivalent for maintenance purposes.

The milk yield and composition of the milk will naturally have a marked effect on the requirement of the animal. The higher the fat content of the milk, the greater its energy content; therefore, milk with a high fat content will require more food per gallon for its production than will milk of low fat content.

TABLE 5.

NUTRIENT REQUIREMENTS PER GALLON OF MILK.

Butterfat Percentage of Milk.	Food Units. (Lb. Starch Equivalent).	Lb. Digestible Protein.
	Per Gallon.	Per Gallon.
3·0	2·2	0·55
3·5	2·45	0·61
4·0	2·7	0·67
4·5	2·95	0·74
5·0	3·2	0·80
5·5	3·45	0·86

Taking 4 per cent. milk as the standard, each increase or decrease of 1 per cent. in the butterfat content of the milk entails an increase or decrease of 0·5 lb. starch equivalent in the ration necessary to produce one gallon of milk.

The digestible protein requirements for milk production are equivalent to 25 per cent. of the starch-equivalent figure.

Table 6 gives the popular dairy breeds kept in Queensland, setting out their average liveweight when mature, and the average butterfat content of their milk, together with the requirements in food units (starch equivalent) and pounds of protein for maintenance and separately for the production of each gallon of milk of average fat content.

By committing the few figures contained in this table to memory, it is possible to roughly assess the food requirements of a herd of any given breed. It must be borne in mind, however, that these figures apply only to average conditions, and for particular purposes it may be necessary to use more detailed and accurate information.

Plate 95.

GRAINS ARE A GOOD SOURCE OF CONCENTRATE ENERGY.—They are relatively low in protein and must be fed either with a legume roughage as supplement to actively growing pasture or the concentrate mixture should include some protein meal.

TABLE 6.

Breed.	Average Liveweight.	Average Butterfat Content.	Requirement for Maintenance.		Requirement for Each Gallon of Milk.	
			Food Units. (Lb. S.E.)	Lb. Protein.	Food Units. (Lb. S.E.)	Lb. Protein.
Australian Illawarra Shorthorn	1,000–1,100	4·0	6·2	0·63	2·7	0·67
Jersey	800–900	5·4	5·3	0·52	3·3	0·81
Ayrshire	1,000	4·2	6·0	0·60	2·8	0·68
Friesian	1,200	3·5	6·8	0·70	2·5	0·61
Guernsey	900–1,000	5·0	6·0	0·60	3·2	0·80

MINERAL REQUIREMENTS.

As pointed out previously, the important minerals from the point of view of the nutrition of dairy cows in Queensland are calcium and phosphorus and, to a lesser extent, salt.

The requirements of calcium and phosphorus are closely related as they are utilized in much the same way in bone formation and milk production.

Under grazing conditions there is little likelihood of a calcium deficiency; but cattle will frequently suffer from phosphorus deficiency which will manifest itself fairly rapidly when pastures become depleted.

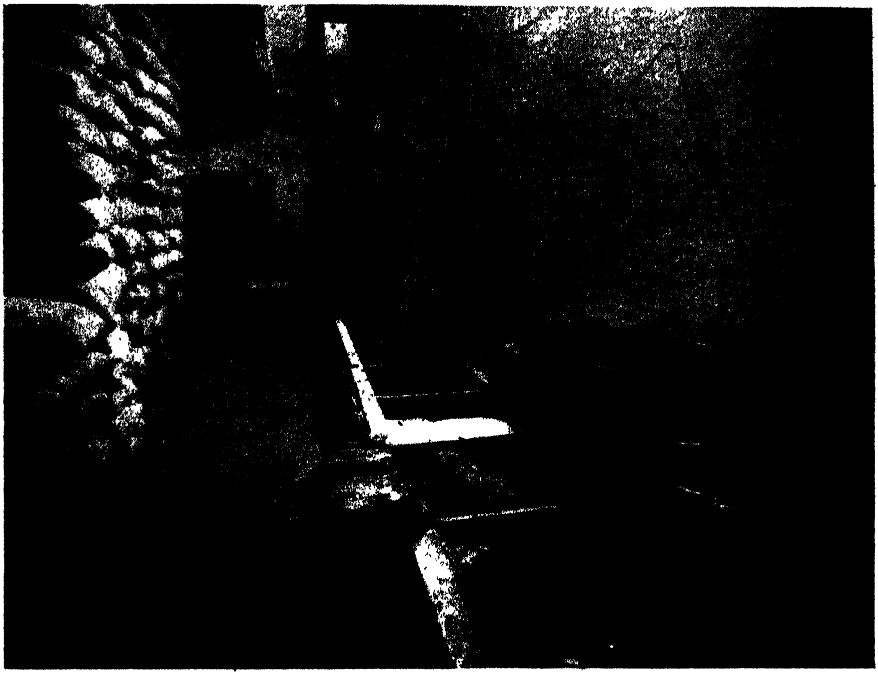


Plate 96.

HOPPERS CONTAINING MEALS READY TO BE MIXED INTO FEEDING MIXTURES FOR STOCK.

Indications of phosphorus deficiency are loss of appetite, with an abnormal craving and the chewing of bones, wood, tins and carrion. Milk yield is reduced and cows are frequently difficult to get in calf. The beast loses condition, the coat becomes harsh and rough in appearance and the gait becomes stilted and stiff. Bone structure is softened and bones break easily.

Rations of dry pasture or hay are deficient in phosphates. Grains and meals usually contain adequate phosphorus. In deficient areas cattle maintained chiefly on pasture require a supplement of bone-flour. This can be fed as a lick or in a small quantity of concentrate in the bail. Cows obtaining large amounts of concentrate, such as grains and meals, as supplements to grazing will receive sufficient phosphorus in these rations.

American workers estimate the phosphorus requirements at from 0·25 to 0·30 per cent. of the dry matter in the ration—that is, 1 part to 400 or 330.

The calcium requirements of the dairy cow have been estimated to be at least 0·25 per cent. of the dry matter in the ration—that is, 1 part to 400.

Generally pastures contain sufficient calcium for normal maintenance, as do most of the commonly used roughages; but grains, bran, and some of the meals are quite low in lime, and cows on concentrate feeds and not receiving legume roughage should receive 2 per cent. of ground limestone in the concentrate ration.

Salt is unlikely to be deficient in pasture-fed stock, but cattle being heavily stall-fed should receive 1 per cent. of salt in the concentrate ration.

Plate 97.

Protein-rich Meals May be Fed in the Bails.—They are only necessary to balance the ration when pastures are mature or when quantities of non-legume roughage are to be used. Avoid drawing unduly on the small stocks of these meals by producing some legume roughage on the farm.

VITAMIN REQUIREMENTS.

The only vitamin of importance in compounding dairy cattle rations is vitamin A.

This vitamin is supplied in excess by young green pastures, and as the cow has the capacity to store vitamin A relatively long periods of low intake can be bridged by the material stored when it was available.

Deficiency in vitamin A can cause abortions, and in severe cases cows may prove difficult to get in calf.

During periods when pastures are mature or likely to be low in vitamin A, the animal can be supplied with the vitamin by feeding on good-quality lucerne hay or other legume.

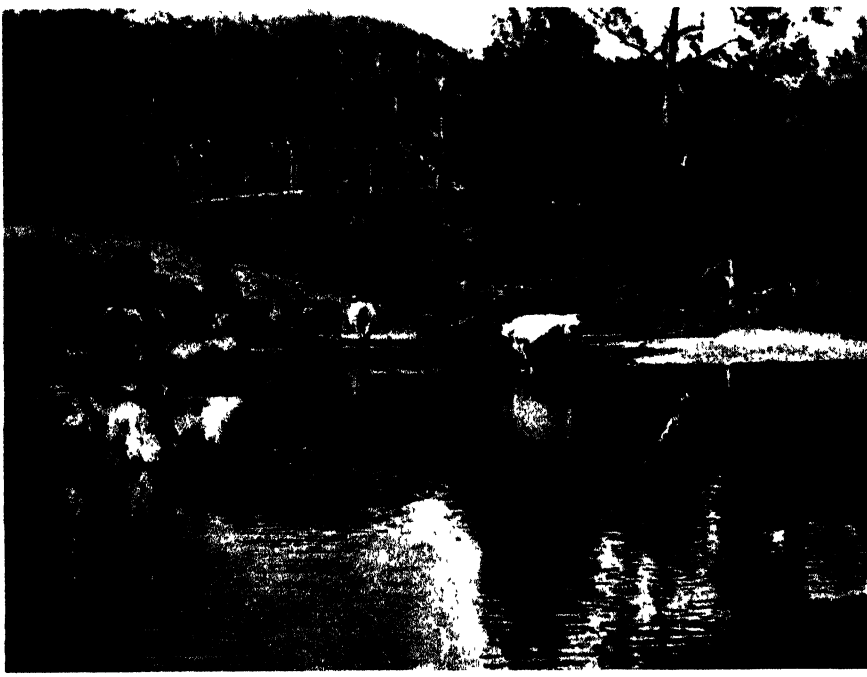


Plate 98.

ADEQUATE FRESH WATER SUPPLIES AVOID WASTE OF FOOD MATERIAL WHICH RESULTS FROM MILKING COWS WALKING LONG DISTANCES TO WATER.

PREPARATION OF THE RATION.

Given the liveweight of the cow, her daily milk production and the butterfat content of the milk, together with the fodders available, it is then a matter of simple estimation to work out the daily ration which should be fed to maintain body weight and constant milk flow.

The following is an example of the method to be adopted:—

An A.I.S. cow weighing 1,000 lb. is producing 3 gallons of 4 per cent. milk per day and is to be fed on a mixture of lucerne and oaten hay with bran, meatmeal and crushed maize.

For maintenance the cow requires 6 food units and 0·6 lb. protein (Table 4).

For each gallon of milk she requires 2·7 food units and 0·67 lb. digestible protein (Table 5). Thus, for the production of 3 gallons of milk she requires 8·1 food units and 2 lb. protein.

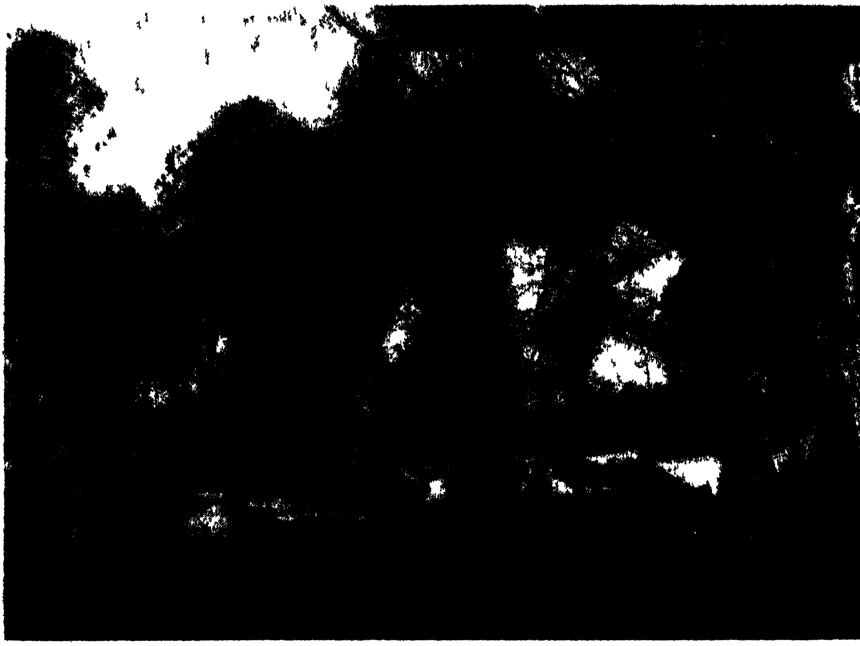


Plate 99.

SHADE AND SHELTER FROM INCLEMENT CLIMATIC CONDITIONS ENSURES MORE EFFICIENT CONVERSION OF FOOD TO MILK.

TOTAL FOOD REQUIREMENT

—	Food Units	Protein
		Lb.
For maintenance	6·0	0·6
For production . .	8·1	2·0
	14·1	2·6

The cow will consume approximately 30 lb. dry matter per day (Table 3).

On a diet of lucerne hay 50 per cent. and oaten hay 50 per cent., the cow would receive a total of 10 food units and 2.1 lb. protein, calculated as follows:—

15 lb. lucerne hay	5 food units	1.8 lb. protein
15 lb. oaten hay	5 food units	.3 lb. protein

This ration is adequate in bulk but deficient in both food units and protein. It requires the replacement of some roughage by concentrate feed.

Thus, if we allow the roughage to cover approximately the maintenance requirements only—

10 lb. lucerne hay	3.5 food units	1.2 lb. protein
10 lb. oaten hay	3.5 food units	.2 lb. protein
	7 food units	1.4 lb. protein

This leaves 7.1 food units and 1.2 lb. of protein to be supplied by 10 lb. of concentrate.

Since 10 lb. of maize contains 7·7 food units and 0·8 lb. protein, maize alone is too high in energy and too low in protein to balance the ration.

Substituting 4 lb. of meatmeal for 4 lb. of maize we get—

6 lb. maizemeal	4·6 food units	·48 lb. protein
4 lb. meatmeal	3·1 food units	2·16 lb. protien
	7·7 food units	2·64 lb. protein

This contains both too much energy and too much protein.

Substituting 3 lb. of bran for 3 lb. of meatmeal, we get—

6 lb. maizemeal	4·6 food units	0·48 lb. protein
3 lb. bran	1·7 food units	0·30 lb. protein
1 lb. meatmeal	0·77 food units	0·54 lb. protein
Approx.	7·1 food units	1·3 lb. protein

This approaches very closely the requirement of the ration.

The complete ration would then be—

10 lb. oaten hay	3.5 food units	1·2 lb. protein
10 lb. lucerne hay	3·5 food units	0·2 lb. protein
6 lb. maizemeal	4·6 food units	0·48 lb. protein
3 lb. bran	1·7 food units	0·3 lb. protein
1 lb. meatmeal	0·77 food units	0·54 lb. protein
30 lb. ration	14·07 food units	2·72 lb. protein

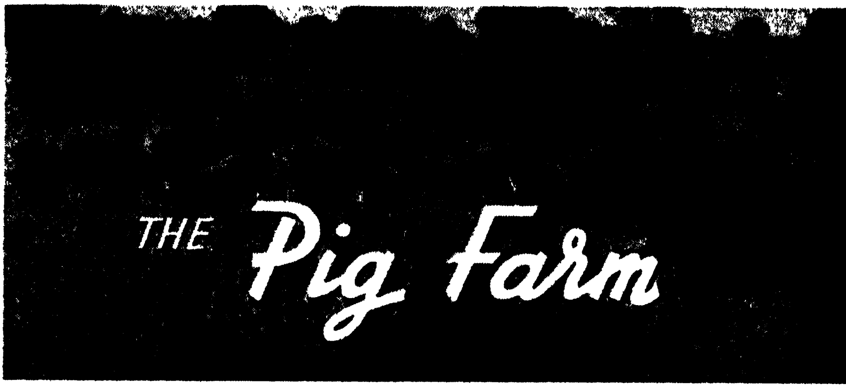
Provided good quality lucerne hay has been used this ration will contain adequate vitamin A.

It will also contain sufficient phosphorus and calcium.

Bushel Weights.

	Lb. per bushel.		Lb. per bushel.
Barley	50	Peas	60
Beans	60	Pollard	20
Bran	20	Prairie Grass	20
Cowpeas	60	Rhodes Grass	20
Grass Seeds	20	Rye Corn	60
Lupins	60	Rye Grasses	20
Maize	56	Setaria	60
Mangolds	20	Sorghum	60
Meals	20	Soy Bean	60
Millets	60	Tares	60
Oats	40	Vetches	60
Paspalum	20	Wheat	60

The ton is fixed at 2,240 lb., except for bran, pollard, and flour, which are 2,000 lb. to the ton.



The Feeding of Pigs.

F. BOSTOCK, Officer in Charge, Pig Branch.

AS a factor in economical pig production the importance of correct feeding is indicated by the fact that feed represents a very large proportion of the total cost of production. The farmer who expects to make maximum profits should, therefore, realise the significance of suitable rations and proper methods of feeding.

Pigs are kept on many farms as a means of marketing the surplus grain produced and to utilize dairy by-products. The feeder should have some knowledge of the suitability of the variety of feeds available and, at the same time, realize that complete success cannot be achieved unless thought and care are given to organization, management, layout of the piggery, selection of good quality breeding stock and a high standard of sanitation.

Feeding can influence the quality of the flesh produced and fat development, but breeding also carries weight and good quality breeding stock should always be used. Prime quality pigs are only produced by proper selection of breeding stock, combined with right feeding and good sanitation.

The body development of growing pigs is continually changing, and experimental work has shown that some parts of the body develop more quickly than other parts. In the first stage, partly before birth, bone development predominates; during the second stage, muscular growth takes precedence; in the third stage the greatest tendency is to fat development. Early-maturing pigs pass through all stages more rapidly than late-maturing pigs.

Consideration of these factors indicates that, to obtain desirable development of the carcase, pigs should be well fed during the stage when muscular growth predominates, that is, up to light porker stage.

PRINCIPLES OF FEEDING.

Feeds are usually divided into two classes—concentrated feed, or concentrates; and bulky feeds, commonly called roughages.

The seed of all plants, whole or ground, and all such feeds as are produced from the by-products of commercial establishments, supply

a large amount of nutriment in small bulk, and are called concentrates. The "body" of plants, in the form of hay, straw, green feed, pastures, and root crops, gives bulky feed or roughage.

The function of bulk in a ration is more than the mere provision of nutriment; in a mechanical way it aids digestion, for the stomach has to be comfortably filled to produce contentment. The pig, however, requires less bulky feeds than other domestic animals, but it has been found that bulk or roughage, to some extent, is very valuable in the profitable production of pork. Where roughage is not supplied and the animal is fed exclusively on concentrates, derangement of digestion usually results.

Food Constituents.

From a chemical standpoint, the constituents of feed which immediately concern the pig feeder are the nitrogenous substances, the carbohydrates and fats, and the minerals. The first-named, generally termed proteins, are used chiefly for the development of flesh. The carbohydrates, embracing starches, sugar, &c., together with the fats and oils, are used for making fat and for the supply of body heat and energy. Mineral matter or ash is not only valuable in bone-forming processes, but is necessary for the normal functioning of every organ of the body.

When feed is utilized in the animal body, a certain amount of heat is generated. This heat is converted into energy, which is necessary wherever work is performed. The term "work," however, has a very wide meaning and denotes more than actual muscular effort; for, in fact, the performance of nearly every function of the body is actually some form of work, involving the expenditure of energy. It is readily apparent that the heat-producing powers of feed have a much more important function than merely the maintenance of bodily warmth.

Importance of Balancing a Ration.

A ration should, therefore, be properly balanced with proteins, fats, and carbohydrates, and should contain a sufficiency of mineral matter. It also should be suitable as to digestibility and bulk.

To balance a ration or obtain the nutritive ratio, which denotes the number of parts by weight of digestible carbohydrates and fats associated in the food with one part of digestible protein, multiply the percentage of digestible fat by 2·25 (because 1 lb. of fat is approximately as effective as 2·25 lb. of carbohydrates) and add this to the percentage of digestible carbohydrates; then divide by the percentage of digestible protein. When this ratio is more than 1 to 7·0 the ration is said to be wide, and if less than 1 to 4·0 is said to be narrow.

Suitable Nutritive Ratios.

The following nutritive ratios will be found to be suitable for the different classes of stock:—

Weaners	1 to 4·0
Stores	1 to 4·5 to 1 to 5·0
Fattening Pigs	1 to 5·0 to 1 to 5·5
Baconers	1 to 6·0 to 1 to 7·0
Sows in Milk	1 to 5·0
Stud Boars	1 to 5·0

While the nutritive ratio is undoubtedly a good means of determining whether a ration is suitable, it should only be regarded as a rough guide, for it has been found in experiments that pigs increase in weight more in accordance with the total digestible nutrients than with nutritive ratio.

Total digestible nutrients per day suitable for different classes of stock would be:—

Weaners	1·8 to 2·0 lb.
Stores	2·18 to 2·5 lb.
Fattening Pigs	2·96 to 3·4 lb.
Baconers	3·74 to 4·5 lb.
Sows in Milk	7·2 to 8·4 lb.
Stud Boars	7·2 to 8·4 lb.

The following table shows analyses of samples of various feeding stuffs. These analyses can of course vary quite a lot.

DIGESTIBLE NUTRIENTS PER 100 LB. OF VARIOUS FEEDING STUFFS.

Feed.	Crude Protein.	Carbo-hydrates.	Fat.	Total.
Barley	8·4	67·5	2·0	80·4
Wheat	9·2	67·5	1·5	80·1
Maize	7·0	65·5	3·5	82·4
Sorghum	8·7	66·2	2·2	79·9
Oats	9·6	49·5	4·1	68·3
Peas	19·0	55·8	0·6	76·2
Millet	8·4	63·7	2·4	77·5
Beans	18·8	51·3	0·8	71·9
Rice	6·2	69·7	1·7	73·1
Canary Seed	11·5	48·7	4·3	71·0
Pumpkins	1·1	4·5	0·5	6·7
Artichokes	1·0	14·6	0·1	15·8
Arrowroot	0·1	18·5	..	18·5
Cassava	0·6	26·4	0·2	27·4
Sweet Potatoes	0·9	24·2	0·3	25·8
Potatoes	1·1	15·8	0·1	17·1
Mangolds	0·8	6·4	0·1	7·4
Melons	0·5	3·9	0·2	4·8
Molasses	1·0	58·5	..	59·5
Separated Milk	3·6	5·1	0·2	9·1
Meatmeal	56·2	..	7·2	71·4
Blood Meal	67·0	..	1·3	71·0
Fish Meal	40·1	..	8·3	58·8
Pollard	13·4	46·2	4·3	69·3
Bran	12·5	41·6	3·0	60·9
Linseed Meal	31·7	37·9	2·8	75·9
Peanut Meal	40·3	22·5	9·2	83·5
Peanuts with shell	17·9	8·2	32·6	99·4
Soybeans	33·2	24·7	16·1	94·1
Cottonseed Meal	31·6	25·6	7·8	74·8
Green Lucerne	3·3	10·4	0·4	14·6
Sugarcane	0·4	12·3	0·6	14·1
Green Rape	2·6	10·0	0·3	13·3
Green Maize	0·8	9·9	0·3	11·4
Lucerne Hay	10·6	39·0	0·9	51·6
Oaten Chaff	2·2	34·3	1·2	39·2
Wheaten Chaff	1·1	25·7	0·6	28·2
Bracken Fern Root	7·9	54·0	0·5	62·5

Some Definitions.

Ration is the quantity of food given to one animal for 24 hours, whether given in one or more feeds.

Balanced Ration is the total quantity of food containing the various digestible nutrients in the correct proportions for a given animal for 24 hours.

Maintenance Ration is the quantity of food required by an animal for body maintenance in 24 hours.

Digestible Nutrients is that portion of the crude nutrients which can be assimilated by an animal.

Protein is the term used to denote those nitrogenous compounds used chiefly for growth, flesh development, milk production and reproduction in animals.

Carbohydrates include starches and sugars, comprise the greater part of grains, and besides being used for production of heat and energy, are the main source of fat in the carcase.

Fats can influence the type of fat produced in the carcase. Soft fats or fats of low melting point are generally to be found in grains and such crops as peanuts, soybeans and linseed; on the other hand, fats of animal origin, such as fat in meatmeal, are comparatively hard or of high melting point, and do not affect the quality of the carcase.

Fibre: For maximum growth rates and efficient use of feed, pig rations should not contain a high proportion of fibre. Therefore bulky feeds, such as chaff, hay, silage, &c., should not constitute too great a part of the ration.

Minerals are necessary for normal growth and building up of harder tissues of the body, such as bone. Insufficiency of calcium, iron and phosphorus in the ration will lead to serious trouble and setbacks in growth.

Palatability denotes that foods are pleasing to the taste of animals; it is affected not only by the actual composition and condition of the food, but by the custom of the animals which are being fed.

PREPARATION OF FEEDS.

Most feeds require little preparation for pigs. Maize may be fed shelled or on the cob; it is not materially improved by grinding. Coarsely grinding or cracking small grains, on the other hand, results in a saving of feed. The extent to which a saving can be made by this operation depends somewhat on the hardness of the grain, but primarily on the method of feeding. Because of the pig's habit of rapid eating when hand fed in groups, a large number of small hard grains escape being broken by the teeth, and pass through the body unutilized. Pigs accustomed to eating from a self-feeder eat more slowly and masticate their food more completely than do hand-fed pigs.

Soaking is a poor substitute for grinding small grains, and does not improve the value of maize or cracked grains.

Cooking reduces rather than increases the value of most foods for pigs, hotel and slaughter-house refuse, also English potatoes, being the exceptions. A slight benefit may result by feeding a warm swill in very

cold weather. Slopping or swill feeding is an old practice, but tests have not justified its use when fattening pigs, and there is very little evidence to show that it is necessary even with brood sows.

SUITABLE FEEDS.

Maize.

Of all cereals, maize is the richest, or one of the richest, in carbohydrates and fat. Maize when fed alone does not supply an efficient ration, especially for growing pigs; and when being hogged down, or fed either on the cob or shelled, it should be supplemented with some protein-rich food.

Pigs fatten well on maize; but, as it produces a softer bacon than that from pigs fed on most other grains, it should not be fed to excess in the later stages of the preparation of baconers.

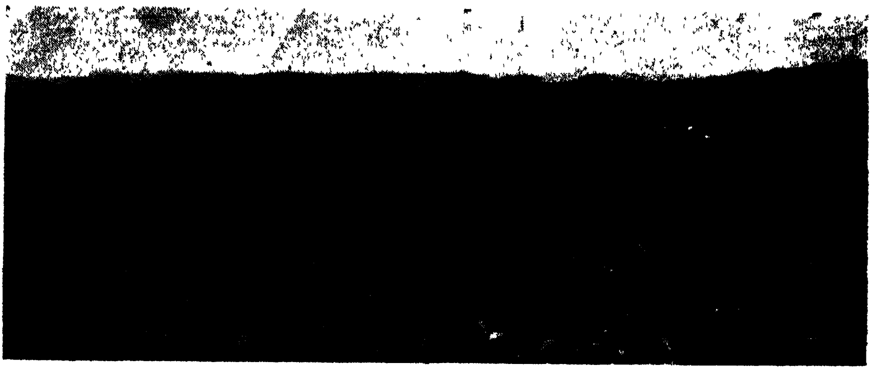


Plate 100.

A Crop of Milo Dwarf Sorghum, an Excellent Grain Crop for Pigs.

Sorghum.

Grain sorghum seed has a fattening value equivalent to 80 to 85 per cent. of that of maize; when fed alone it is an insufficient ration, and should therefore be supplemented with a protein-rich feed. Because of the hardness and size of the grain, grinding may be necessary, especially for young pigs. Outstanding qualities of these grains are their drought-resistance and sureness of cropping. Pigs fatten well on grain sorghums, but unless properly balanced with protein supplements are inclined to produce bacon of inferior quality.

Barley.

Of all grains, barley is recognised as the best for fattening pigs. It produces pork and bacon of the finest quality, and, particularly, the fat produced is hard, white, and free from greasiness. Barley may be fed alone or with other grains.

Wheat.

Wheat may be fed alone or with other grains. It is an excellent feed for pigs, yielding firm flesh and a satisfactory fat, and possessing a nutritive value equal to barley, while from a protein point of view it is superior to barley. One disadvantage is that if finely ground it is inclined to become doughy when moistened, and for this reason should only be cracked.

Oats.

Oats are not ordinarily used as pig food because of the large percentage of husk, and when fed to young pigs they sometimes develop scouring. Oats produce a good quality pork or bacon.

Peas.

Peas are rich in protein and are, therefore, useful in balancing such grains as have a high carbohydrate content. Fed alone, they produce a very hard, lean flesh, and young pigs do not thrive on them. Good results are obtained when peas are mixed with other grains, but they should not constitute more than 25 to 30 per cent. of the ration.

Millet.

If fed alone, millet will produce pork or bacon of inferior quality and inclined to be soft. For best results, millet should be mixed with other grains and should never exceed more than 30 to 35 per cent. of the ration.

Beans.

Beans also produce pork or bacon of inferior quality when fed alone, but can be profitably used with other grains, although they should not form more than 15 per cent. of the ration. Beans are not very palatable to pigs of any age.

Rice.

Rice, if fed in excessive quantity, will produce flesh inclined to be soft. Because of the large percentage of husk, rice should not exceed 25 to 30 per cent. of any ration.

Canary Seed.

An analysis of this grain indicates that the fat and protein contents are greater than for most other grains. However, the additional protein is not so great that it would materially reduce the protein supplements necessary to balance the ration.

With a high fat content, excessive feeding of canary seed would tend to produce a soft fat and for this reason it is recommended that it constitutes not more than 50 per cent. of the grain ration.

Arrowroot.

Arrowroot is a useful crop, heavy yielding, hardy, and will stand in the field for long periods before it need be harvested. Although most of the nutriment is in the bulbs, pigs will eat the tops, which are usually succulent. Arrowroot may be fed raw or boiled, or the pigs may be allowed to harvest the crop themselves. This feed is a carbonaceous roughage and should be fed in combination with more concentrated and protein-rich foods.

Potatoes.

Potatoes consist of about 75 per cent. water and 25 per cent. dry matter, which for the most part is composed of starch. In view of this large quantity of water, 4 lb. of potatoes are generally accepted as being equal to 1 lb. of maize or wheat. This raises the question of bulk. While potatoes may be fed to all classes of pigs, best results will be obtained when pigs are 16 tc 18 weeks old, at which stage the digestive tract will have grown sufficiently to cope with the necessary bulk, and one-third of the grain ration may be replaced by potatoes. As pigs

become older the proportion may be increased. Thus, by the time pigs are about 23 weeks old, two-thirds to three-quarters of the ration could be replaced, but it would not be advisable to go beyond this point.

Usually potatoes are too valuable to be used as pig feed, but when they are available they should be boiled.

Sweet Potatoes.

Sweet potatoes are a bulky carbonaceous food which may be used to replace portion of the grain ration; about 4 lb. of sweet potatoes are considered equal to 1 lb. of grain. Pigs of all ages relish sweet potatoes, and they may be dug and fed in the yards, or pigs may be turned on to the crop and allowed to do the harvesting themselves. The vines make good green feed, but there have been cases of poisoning; this risk, however, is very slight when compared with the large number of pigs which are fed on this crop. When pigs are fed on sweet potatoes, protein-rich foods, such as separated milk or meatmeal, should be included in the ration.

Peanuts.

Peanuts may be fed to pigs of all ages, but because of their very high oil content (about 36 per cent.) will produce soft or oily bacon, and therefore should be eliminated from the ration at least six weeks before the pigs are ready for market.

Soybeans.

Soybeans also are excellent food for young pigs, but should be used in the same way as peanuts. The high oil content of the soybean (about 17 per cent.) will produce soft pork or bacon.

Molasses.

Molasses contains approximately 57 per cent. of carbohydrates in the form of sugar, and is therefore a heat and energy producing food. It has a laxative effect on pigs, and is useful in dry seasons when green feed is not available or in short supply. Molasses should be fed in only small quantities, as careless feeding may cause severe diarrhoea.

Cassava.

The root of cassava has a similar analysis to sweet potatoes. However, care must be taken unless the variety intended for feeding is known to be safe, because several varieties contain a prussic-acid yielding glucoside. Overseas feeding tests have shown that when cassava constitutes one-half of the ration severe scours result, but if only forming one-third of the ration good results are obtained.

Cassava has a value as a "stand-over" or reserve crop.

Mangolds.

These are a bulky carbonaceous food containing approximately 85 per cent. of water. They may be fed to all classes of pigs, best results being secured when pigs are 16 to 18 weeks of age, at which time up to one-third of the grain ration may be replaced by mangolds.

While there have been no reported cases of loss when feeding mangolds fresh, it is a good practice to store or allow to wilt for one or two days in a cool place before feeding. Reports have been received of poisoning when mangolds have been cooked.

Sugarcane and Cow Cane.

These feeds contain large amounts of fibre not digested by pigs, and are of low food value, but during dry periods or when green feed is not available they may serve a useful purpose. Plenty of cane should always be fed, otherwise constipation may result from pigs feeding on the fibre.

Pollard.

Pollard is a valuable addition to grain foods, helping very considerably in balancing the ration, and its fineness makes it very suitable for young pigs. When fed alone, it has a tendency to produce soft flesh. The best results are obtained when it is used as a supplement to grain foods.

Bran.

Bran, when fed wet, has a laxative action, so is useful in preventing constipation in sows. It is usually given just before or after farrowing. It is not recommended as a fattening food.

Meatmeal.

Meatmeal, a protein-rich food, is a meatworks by-product, and is very valuable in balancing grain rations when milk or milk by-products are unavailable.

Blood Meal.

Blood meal is a protein concentrate containing 60–75 per cent. protein. Its palatability varies, but if mixed with other supplements it gives good results.

Fish Meal.

As a protein supplement, fish meal is equal to meatmeal, but if fed in excessive quantities may give a fishy flavour to the carcase.

Linseed Meal.

Linseed meal should form only 6 per cent. of a ration. It is a protein-rich food, has a fairly high oil content and exerts a laxative action.

Cottonseed Meal.

Cottonseed meal, a by-product, is a protein supplement. Its use has been limited because some cases of poisoning have been reported when fed in too large a proportion or over lengthy periods. Recent experiments, however, have indicated that up to half the protein supplement of a ration may consist of cottonseed meal.

Cocoa Meal.

Cocoa meal cannot be recommended as a food for pigs, and has been known to cause abortion in sows.

Peanut Meal.

Peanut meal is a source of protein supply which gives good results, but it is preferably mixed with equal parts of meatmeal, the mixture being fed at the same rate as recommended for meatmeal. Peanut meal should not be fed in excess, because the bacon produced may be soft and have a distinct flavour.

Pumpkins.

Pumpkins contain over 80 per cent. of water and are therefore a bulky food, but they are palatable to pigs and best fed raw.

The seeds of pumpkins contain a fair amount of oil and protein and also act as a mild worm killer. For these reasons they should not be wasted; but they should be fed with caution, as digestive troubles sometimes occur when excessive amounts of seeds are fed without the flesh of the pumpkin.

Pumpkins can be ready for feeding in good seasons from December onwards, and if stored in a dry, cool place and picked over frequently to remove the rotting ones the pumpkin supply may be kept up till the following summer.

Pigs relish pumpkins and the crop fits into the cropping system very well. Pumpkins are useful when fed in combination with grain, milk and lucerne. Cases of yellow colouration in the flesh of pigs fed heavily on pumpkins have been reported; therefore, care should be taken not to overdo pumpkin feeding with porkers or baconers.

Melons.

Melons are sometimes used as pig food, but contain approximately 95 per cent. of water. They are therefore not so nutritious as pumpkins.

Candlenut.

Refined oil from the candlenut has been used as a substitute for linseed oil, but as in the case of raw oil it causes severe scouring when included in the ration fed to pigs. The residue after extraction is known to contain poison and when fed to brood sows may cause abortion due to severe pain associated with the scouring. Candlenut meal or oil is not recommended as pig food.

Skim Milk and Buttermilk.

In supplementary value, skim milk and buttermilk excel any other single feed. They are especially recommended for pigs just weaned, as they are very palatable and digestible. They usually contain between 3 and 4 per cent. protein, and supplement well the proteins of farm grains. Skim milk and buttermilk also are rich in essential mineral elements.

While these feeding stuffs are of equal value for pigs, precautions should be taken to see that the buttermilk has not been diluted with wash water. Both should be pasteurized or boiled in order to prevent the possibility of tuberculosis. Their high value is shown by the fact that roughly 200 lb. can be considered worth as much as a bushel of maize.

When these by-products are fed in small amounts they have a higher value per pound than when they form a large proportion of the ration. Young pigs require larger proportions of milk to grain than do older pigs. It will be found that about one gallon of skim milk or buttermilk per day will balance a maize ration for pigs from weaning age to market weights. During the period of rapid growth (between 90 and 130 lb.), 1½ to 1¾ gallons may be utilized very profitably.

Whey.

Whey has a value of approximately half that of skim milk or buttermilk.

Relative Value of Feeding Stuffs.

One pound of grain (barley, wheat, maize or sorghum) is approximately equal to—

4 lb. sweet potatoes.
4 lb. English potatoes (boiled) or artichokes
5 lb. arrowroot.
6-8 lb. pumpkins or apples.
8-9 lb. mangolds, turnips, or carrots.
5-10 lb. green pasture or forage crops.
10 lb. separated milk or buttermilk.
9-15 lb. kale, kohl rabi, cabbage, cauliflower or melons.

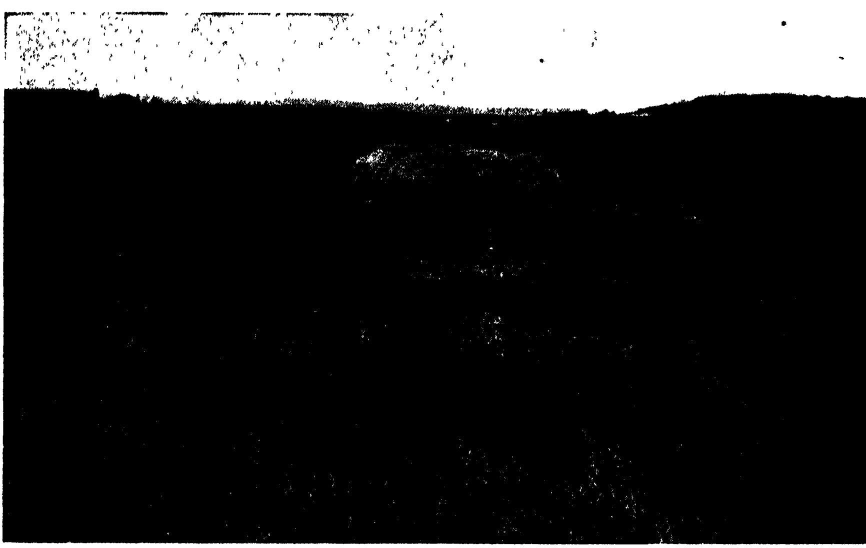


Plate 101.
A PADDOCK OF KIKUYU GRASS PROVIDING EXCELLENT GRAZING FOR PIGS.

GRAZING.

There is nothing which will solve as many of the problems of pork and bacon production as an abundance of good forage.

Pastures, when green and growing rapidly, are one of the best and cheapest kinds of food for pigs. They provide nutrients needed to balance grain feeds at a lower cost than supplements can be purchased, and pigs make more rapid gains when allowed the run of good pastures. More sanitary conditions are to be found where grazing is practised, as well as a reduction in losses from disease. The best foundation for economical production of pork is the maximum use of good quality forage crops and pasture.

One of the advantages of a good mixed grass and clover pasture is the large amount and high quality of the protein supplied. Protein compounds vary as much in quality as a champion boar of to-day differs from the "Captain Cooker" or "Razor-back" of yesterday. All grains

are deficient in some of the essential nitrogen compounds called amino-acids. Pasture crops are rich in the substances needed to make a balanced protein supply, and for this reason pastures have more value than simply saving grain.

The vitamin requirement of pigs is becoming better understood and, while there is always a tendency to over-emphasise a new theory, it is realised now that a lack of certain vitamins limits the growth of pigs. Pasture crops are rich in vitamin A. Vitamin D is not abundant in green feeds, but when pigs are grazing they are exposed to the sun's rays, certain of which ensure the requirements of this vitamin. Other vitamins are not so likely to be lacking in rations fed to pigs as A and D, and the more varied rations when pigs are on pasture help to assure an adequate supply.

Plate 102.

PIGS GRAZING ON LUCERNE. CAREFUL MANAGEMENT OF THIS VALUABLE CROP IS IMPORTANT.

Minerals are needed by growing pigs; the most common shortages are in calcium and phosphorus. Grains are low in calcium but, where milk by-products are fed, this shortage is supplied to some extent. Legumes in pastures and rape are rich in calcium. While pastures are very valuable feeds, pigs cannot grow profitably on pasture only. There is too much water in proportion to dry matter in young grass, and in the more mature stages grasses have too much fibre.

To Summarise:—

Grazing admits an animal to the healthy influence of sunlight and stimulates exercise.

Grazing stimulates the digestive processes and largely assists towards maximum gains in weight.

Grazing provides protein and mineral ash, essential elements in pork and bacon production.

Grazing effects a saving when compared with sty feeding.

Grazing saves labour.

GREEN CROPS.

When soil and climatic conditions are suitable, lucerne is easily the best green crop for pigs. Careful management of this very valuable crop is important, and it is suggested that pigs be allowed to graze on only portion of the lucerne paddock, and not remain long enough to do damage before being removed to a fresh section. Under some conditions, it may be found more economical to cut and feed the lucerne than to graze it.

The following table shows a number of crops recommended as being suitable for pigs. Further information will be published as "Crop Planting Tables" in this Journal at an early date.

SUITABLE CROPS TO GROW FOR PIGS.

Name of Crop.	When to Sow.	When Available.
Lucerne	April to May	..
Barley	March to June	May to September
Rye	March to June	June to September
Oats	April to June	July to September
Rape	March to May	June to August
Cowpea	September to January	January to May
Pumpkin	August to January	January to June
Maize	August to January	December to May
Millet	September to January	November to March
Sorghum	August to February	December to June
Arrowroot	August to October	April to June
Artichoke	August to October	December to February
Sweet Potatoes	August to January	November to April
Mangolds	February to April	August to October

MINERALS.

Pigs originally obtained their nutriment from natural pastures. Every necessary chemical requirement to produce perfect results was supplied; thus intestinal disorders were almost unknown to animals grazing at will on virgin pastures. To-day, we have these same pigs with much the same constitutions requiring the same balanced nourishment they required in their wild state. We confine them to limited areas and feed them on dry grains and other foodstuffs; consequently some ingredients found in natural pastures are lacking and should be supplied by other means.

Of all farm animals, pigs grow the most rapidly. No other domestic animal shows so quickly the result of mineral deficiency. The rapid development up to 180 or 200 lb. liveweight at 6 or 7 months of age calls for much bone-building material in the food. In addition, sows produce two litters a year, making their demands for minerals very heavy.

Dairy by-products supply a large amount of minerals, but even when these are being fed it is well to provide some additional minerals, and one of the following simple mixtures will be found to meet the general requirements:—

No. 1—Equal parts by weight of—
Ground limestone or air-slaked lime.
Sterilized bone meal.
Salt (fine).

No. 2—Equal parts by weight of—
Wood ashes.
Sterilized bone meal.
Salt (fine).

No. 3—To No. 1 and No. 2 mixture add ⅛ by weight of meatmeal to increase palatability.

No. 4—Mix—
25 lb. ground limestone.
30 lb. fine salt.
15 lb. sulphur.
5 lb. copperas.
1 lb. copper sulphate.

No. 5—Mix—
25 lb. ground limestone.
25 lb. sterilised bone meal.
30 lb. fine salt.
15 lb. sulphur.
5 lb. copperas.
1 oz. potassium iodide.

One of these mixtures should be placed in a small trough protected from the weather to which pigs have access at all times. On the other hand, when dry feeding is practised, 1½ per cent. of ground limestone and 1 per cent. of fine salt may be mixed with the ration or 2 per cent. of one of the above mixtures.

GARBAGE.

The quality of garbage or kitchen refuse varies greatly, and it is very difficult to make any recommendation for supplementary feeds. If garbage consists mostly of bread scraps, some protein concentrate should be added; on the other hand, if large quantities of meat scraps are present, grain or pollard may be included to obtain greater value from the garbage.

Care should be taken to see that no foreign matter such as cloth, paper, glass, nails, &c., is included. There is always a certain amount of risk in garbage feeding, as poisonous and injurious substances may be in the garbage tins and cause the death of animals. Persons feeding garbage are required by law to fulfil certain conditions, details of which may be obtained from the local Town or Shire Council. Garbage should be thoroughly boiled before feeding, otherwise there is considerable risk of disease, such as swine fever, which is carried in meat scraps.

FEEDING THE BOAR.

Generally, boars intended for breeding will maintain their condition on 2 lb. to 4 lb. of grain mixture per day. However, some may be maintained largely on green feed or root crops, with a grain ration of only 1 lb. per day, while others may require up to 5 or 6 lb. daily.

For maximum fertility, it is important that the ration should contain plenty of green feed. It is equally important that a boar

should not be overworked, especially a young animal, say nine months old, and while he is still growing rapidly. In the case of a mature animal, a good general rule would be to provide one boar to every 20-25 sows, but for a young boar just commencing stud work he should not be allowed more than one service a fortnight; also, special attention should be given to the feeding of young boars, and the grain ration should be larger than for the average adult animal, and may be increased to 5 or 6 lb. daily.

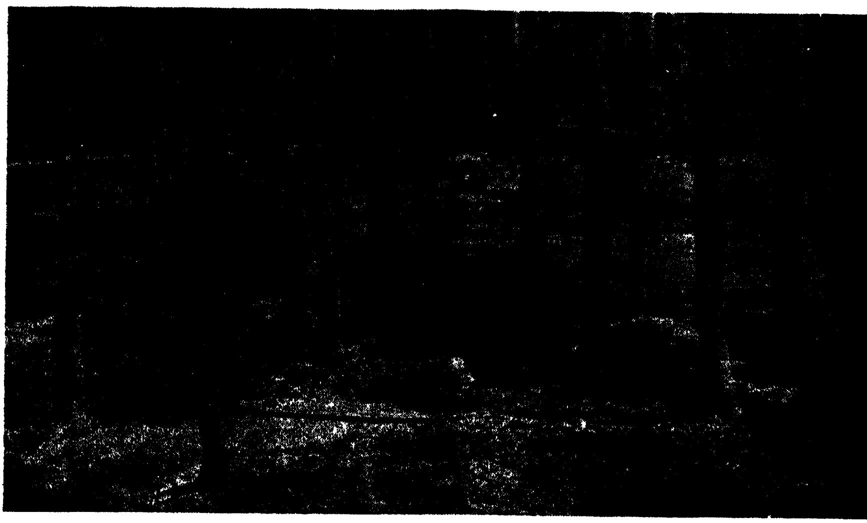


Plate 103.

DIRTY YARDS SUCH AS THE ONE ILLUSTRATED ARE A PROLIFIC SOURCE OF DISEASE INFECTION.

As a general rule, the boar's condition is the best guide as to efficiency of management and feeding. He should be kept in good breeding condition, and not too fat. Over-condition will make the boar lazy, clumsy and impotent, and should be avoided.

FEEDING THE BROOD SOW.

Strong, healthy pigs are what every farmer wants when the sow farrows, and to ensure such pigs, careful feeding and handling of the sow before farrowing are necessary.

The brood sow needs food for three important purposes: first, for her own maintenance; second, for growth of her own body; and third, for the nourishment of the unborn litter. Maize, wheat and barley are too concentrated and lack bone-formers. Skim milk and buttermilk, meatmeal, pollard and grazing (clover, lucerne, kikuyu grass, &c.) are the logical supplements to grain. When available, root crops (sweet potatoes, arrowroot, &c.) are suitable substitutes.

In the early stages of gestation the sow may require little more than good grazing or root crops with approximately 1 gallon of separated milk a day, and clean drinking water available at all times.

However, 5 to 6 weeks before the farrowing date the sow should be separated from the herd and placed in the springer paddock. About 1 to 1½ lb. of grain should then be fed, and this may be increased to approximately 2½ lb. a day with 1½ to 2 gallons of separated milk or ½ to 1 lb. of meatmeal. Consideration, however, should be given to the sow's condition; she should not be permitted to become overfat, as the effect on the litter may be serious. In many cases, such sows have small litters, often overlay a number of pigs, and the milk flow is poor. On the other hand, stronger, healthier litters are usually the result of careful feeding and thought during this period. Above all things, excepting the food supply, is an abundance of exercise. All classes of pregnant animals do well only when opportunity for ample exercise is allowed. The general tone and vigour of the mother is reflected in the offspring—the better the general health and condition of the dam, the stronger and more vigorous the young.

Free range on good pasture is best, and maize may be scattered on the ground well away from the shelter shed or sleeping quarters. When lucerne is fed, feeding racks are useful, as they are conducive to light exercise. If, however, sows are inclined to lie around, exercise should be forced. Such effort will be repaid by increased health and vigour of the litters.

Warmth, dryness, ventilation and sunlight are essentials of the ideal pig shed and run, and such conditions may be assured with little expense and thought. Good dry bedding in winter is needed, and to be kept dry should be changed regularly. The sheds should be arranged so as to avoid draughts and prevailing winds, and should usually face north or north-east. Attention to these points will be amply rewarded.

The sows should be kept free from lice by the application of oil (6 parts of sump oil to 1 part kerosene) at frequent intervals, and the bowels kept laxative, as costiveness is detrimental to both sow and expectant litter.

The essentials of brood sow management may be summarized as:—

Provide suitable food, but do not overfeed.

See that sows have plenty of exercise.

Provide warm, dry, well ventilated sheds.

Kill all lice.

Avoid constipation by natural feeding, but administer medicine if necessary.

Practise gentleness with the brood sow, remembering that good treatment promotes contentment with corresponding profits.

FEEDING SOW AND LITTER TO WEANING.

About 10 days before farrowing, the sow should be placed in the farrowing pen, with access to an exercise yard, in order that she may become accustomed to the new surroundings. A careful watch should be kept to see that her bowels are laxative; if costive, 3 oz. of castor oil in bran mash (1½ gallons separated milk and 1 lb. bran) should be given. No food should be given for some time after farrowing, but clean drinking water should always be available. After about 12 hours, 3 oz. of castor oil in bran mash may be given. This will put the sow in good condition for the job of rearing the litter until eight weeks old.

Careful feeding at this stage is necessary. The ration should be light, consisting of approximately 2 to 2½ lb. cracked grain, and 2 to 2½ gallons of separated milk or 1 to 1¼ lb. of meatmeal. At about six to seven days after farrowing the ration should be gradually increased, taking approximately one week to bring the quantity up to full brood sow ration of 6 to 7 lb. of cracked grain, and 2 to 2½ gallons separated milk or 1 to 1¼ lb. of meatmeal, given in two feeds. These quantities should be accepted as a guide only, as no hard and fast rule can be laid down, each case being judged according to the sow's appetite and size of litter. In addition, plenty of clean drinking water should be always available. This does not apply only to the sow, because whatever their class, pigs do not make maximum gains even with the best of food, unless they have drinking water at all times.

APPROXIMATE WATER REQUIREMENTS OF PIGS.

Liveweight of Pigs.	Approximate Daily Water Requirement.
30 lb.	½ gal.
65 lb.	¾ gal.
100 lb.	1 gal.
200 lb.	1¼ gal.

Suckers.

For some weeks after birth, suckers will do best on sow's milk as a sole diet, and it is therefore important that sufficient supply of this natural and best of all foods should be forthcoming. In the third week suckers should be encouraged to eat supplementary foods, which should be provided in a small trough behind a creep away from the mother. A little cracked grain or cracked grain and pollard, to which is added meatmeal, will not cause digestive troubles and will provide the requirements necessary for rapid growth.

Young pigs require plenty of direct sunlight and exercise, and should be kept in clean yards or allowed the run of good grass paddocks. Scouring and digestive troubles are caused by feeding from dirty troughs, by eating stale food, or by dirty, damp conditions.

Suggested rations to be fed in the creep are:—When the suckers are four weeks of age a little cracked grain may be given; when five weeks old each should be allowed approximately ¼ lb. cracked grain and ⅛ lb. meatmeal per day, after which the cracked grain may be increased by ¼ lb. per week per pig and the meatmeal gradually increased to ¼ lb. per day by the time the pigs reach eight weeks of age or weaning time.

Suitable Mixtures for Creep Feeding.

No. 1.—

Cracked grain (maize, wheat, sorghum)	50 lb.
Pollard	35 lb.
Meatmeal	10 lb.
Linseed meal	5 lb.

No. 2.—If pollard is not available—

Cracked grain (maize, wheat, sorghum)	50 lb.
Meatmeal	15 lb.
Linseed meal	5 lb.

No. 3.—If pollard and linseed meal are not available—

Cracked grain (maize, wheat, sorghum)	50 lb.
Meatmeal	17 lb.

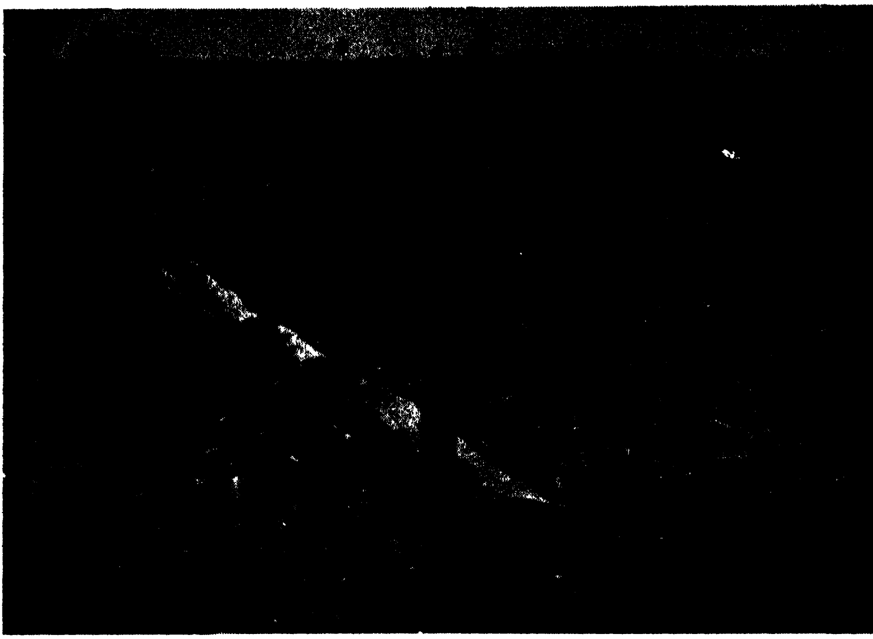


Plate 104.

UNTIDY, LITTERED PIG YARDS SUCH AS THIS SHOULD NOT BE TOLERATED.

WEANING.

One of the principal jobs in pig management is weaning suckers from the sows. The system of weaning followed should include the welfare of both the sow and the suckers. If a sow is a heavy milker, the sudden weaning of her pigs will be apt to result in some of the teats being damaged, but proper handling should reduce this risk. For two or three days before weaning, the sow's food should be reduced. This will assist the drying up of the milk flow; then for two or three days after the sow has been taken away she should be turned in with the suckers for one or two hours each day. If this system is adopted, no trouble should be experienced with the sow's udder.

Weaning time is a critical period in the growth of young pigs. Unless the process is carried out gradually and, as previously mentioned, the young pigs taught to eat solid food while still suckling, growth is always retarded. Also, if weaners are placed in strange surroundings they worry and run along the fences. Other trials such as castration

and sudden changes of food should not be allowed at weaning time. The best time for changes or operations is before weaning, while the suckers still have the benefit of the mother's milk.

Research workers point out that retarded growth at this period has an adverse effect on the quality of the muscular tissue laid down by the pig, and that the incomplete development of the "eye" of meat in the loin is due to a setback at weaning.

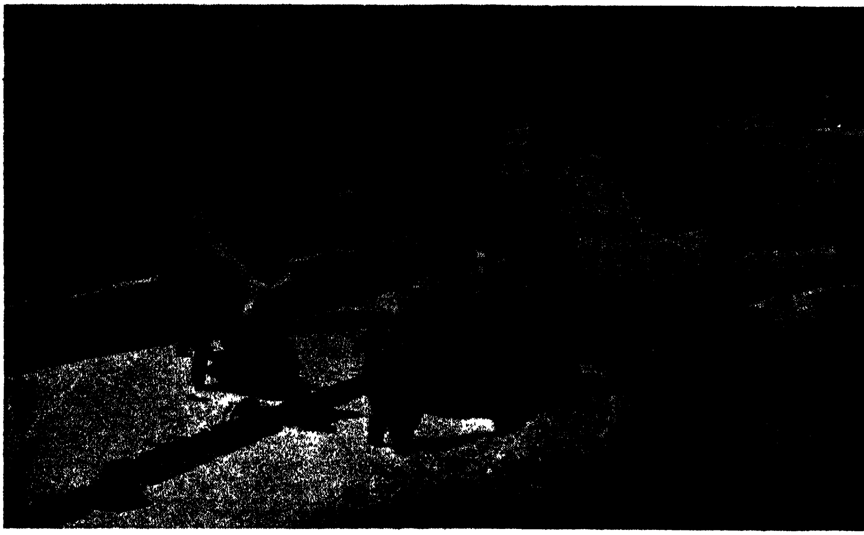


Plate 105.

DISEASE LURKS IN UNCLEAN YARDS.

Weight of the litter at weaning time is of great importance, and such weights can be taken with very little trouble. A very good use of these litter weights is to compare the production of different sows in a herd. In every herd it is found that certain lines of blood are much more valuable than others. Some pigs grow faster, mature earlier, and are ready for market more quickly. Instead of making selections by observation of the growthiness of litters, actual weights will give considerably greater accuracy. Using litter weights, in addition to other reasons for culling, will build up the standard of the herd rapidly.

This system of culling is reasonably accurate, because, in many cases where both the weights of pigs and amounts of feed eaten by each pig are studied, it is found that in 80 out of every 100 pigs those making the heaviest weights for age make the most economical gains.

SUITABLE RATIONS FOR YOUNG PIGS.

Rations tried and found suitable for pigs from weaning age to porkers or baconers are given in the following table, which shows the quantities to be fed each day. It is not intended that these rations should be strictly adhered to, but that they should serve more as a guide to the farmer when determining the most suitable ration to feed under his particular conditions. The practical interpretation of the

table, when maize, skim milk and green feed are available, would be, for 30 lb. live weight pig (weaner), 1 lb. of maize and ½ to 1 gallon of separated milk per day, with good grazing or green feed at midday, the maize and milk to be fed half in the morning and half at night.

The quantity of milk should be kept constant from weaning age to pork or bacon weights, but the maize should be increased ¼ lb. per week per pig, to a maximum of 6 lb.

Should separated milk or buttermilk not be available, some other protein supplement, such as meatmeal or suitable proprietary products, should be used.

SUGGESTED DAILY RATION FOR PIGS.

Live-weight of Pig.	Grain (Wheat, Maize, Barley, Sorghum Seed).	Separated Milk or Buttermilk.	Meatmeal (when Milk By-products are not available.)	Green Feed, if Hand-fed (Lucerne, Barley, Rape, &c.).
Lb.	Lb.	Lb.	Lb.	Lb.
30	1	5	¼	¾ to 1
50	2	7·5	½	¾ to 1
65	2½	7·5	½	¾ to 1
80	3	7·5	½	1 to 1½
100	3½	5	¼	1 to 1½
120	4	5	¼	1 to 1½
135	4½	5	¼	1 to 1½
150	5	5	¼	1½ to 2
165	5½	5	¼	1½ to 2
180	6	5	¼	1½ to 2
200	6	5	¼	1½ to 2

Substitute for Milk.

The chief foods which will be found available in the drier areas of the State are wheat, barley and grain sorghums, but feeding trials have demonstrated that cereal grains alone are uneconomical and should be supplemented. On the coast milk or milk by-products are used, but where dairying is not practised some other protein-rich food should be found as a supplement to grain.

It is generally known that meatmeal is a good substitute for separated milk in the pigs' ration, but it should be used carefully and in correct proportions, otherwise it may prove expensive.

Pigs thrive on small quantities of milk when fed in combination with grains or other foods, and milk supplies the protein necessary to balance the ration. Each pig from weaning age to bacon weight, and dry sows, should receive a minimum of ½ gallon per day. Sows with litters require at least 1½ gallons per day to balance the ration; larger quantities may be used to advantage. However, when these minimum quantities of milk are not available, meatmeal may be substituted, using ¼ lb. of 60 per cent. meatmeal to replace each ½ gallon of separated milk. However, the quantity used should not exceed ¼ to ½ lb. per pig per day from weaning age to baconer weight, with ¼ lb. per day for dry sows, and 1¼ lb. daily for sows and litters.

In cases where pigs have access to good grazing or green crops, the quantity of meatmeal may be reduced by up to 50 per cent., depending on the quality of the green food available.

Meatmeal may be mixed with water, fed dry, or mixed in correct proportions with a meal.

Suggested Ration for Growing Stock.

Crushed grain (wheat, barley, maize or sorghum)	80 lb.
Meatmeal (60 per cent.)	9 lb.
Good lucerne or oaten chaff	9 lb.
Fine salt	1 lb.
Ground limestone	1 lb.
	100 lb.

Feeding.

Self-feed or allow each pig when eight weeks of age 1½ lb. per day, given in two feeds, and increase the meal ¼ lb. per week per pig. Clean drinking water and ample grazing area should always be available.

Self Feeding.

The progressive pig raiser is continually on the lookout for equipment which tends toward making for more efficient management; in this regard there is nothing that can lessen the labour costs and make his lot an easier one to the same extent as the installation of self-feeders.

The self-feeder is designed primarily to keep a supply of grain or grain mixture constantly before the pigs and at the same time protect the contents from the weather. Plans and specifications are given in a departmental pamphlet, "Pig Farm Accommodation."

The self-feeder consists of a bin or hopper, to hold the bulk supply of food, and a feed trough below, which is automatically replenished from the bin as the pigs use up the feed. It is necessary to build the self-feeder large enough to hold enough feed for several days. It should be remembered, however, that when the self-feeder is filled it is not a matter of simply leaving it until it is empty; a constant watch should be kept on the flow of food into the trough. In wet weather the food is liable to clog, and together with the mud carried on the pigs' snouts and feet, may choke the outlet; also, the feed may become soiled, making it unpalatable to the pigs. These troubles can be eliminated by daily inspections.

A noticeable feature about pigs that are accustomed to self-feeders is that there is no over-crowding, and only a small quantity of food is consumed at any one time; it is eaten slowly, thoroughly masticated, and there is little or no waste; neither is there any risk of over-eating or serious digestive trouble. It is always advisable to have good pastures for the pigs during the time they are on the self-feeder, and it is important that a permanent supply of clean drinking water is available.

Farmers feeding dairy by-products will have less need to feed mixtures containing protein meals such as meatmeal, &c., as separated milk is very suitable to balance grains such as wheat, maize, and sorghum seed. Dairy by-products should not be self-fed, as they spoil if more is given than the pigs will clean up at one feeding. The practice should be to self-feed the grain, and hand-feed twice daily enough separated milk to balance the ration.

MARKETING

CURRENT FEEDING VALUES FOR MONTH OF OCTOBER, 1948.

(Division of Animal Industry and Division of Marketing).

Feed.	Starch Equivalent Value per 100 lb.	Digestible Crude Protein Value per 100 lb.	Average Wholesale Selling Price at Brisbane.	Cost per Starch Equivalent Unit.	Remarks.
				d.	
			STARCH CONCENTRATES.		
Wheat	72	8	7s. 7d. bushel (ton lots)	2·11	Plentiful
			7s. 9d. bushel (less ton lots)	2·15	
Wheat Meal	72	8	£14 3s. 4d. short ton (2,000 lb.)	2·44	
Maize	78	8	11s. 6d. bushel	2·55	Scarce
Maize Meal	71	8	£23 short ton (2,000 lb.)	3·88	
Sorghum	71	7	None available	..	Scarce
Sorghum Meal	71	7	None available		
Barley	71	7	None available	..	Scarce
Barley Meal	71	7	Not quoted		
Oats	62	8	6s. bushel (ton lots) 6s. 2d. bushel (less ton lots)	2·9-3·06	Plentiful
Crushed Oats	62	8	6s. 2d. bushel (ton lots)		
			6s. 4d. bushel (less ton lots)	3·06	
Pollard	66	10	Not quoted	..	Bran and pollard in limited supply
Bran	56	10	Not quoted		
Molasses	50	..	47s. 6d. per 44 gallons	2·59	
			PROTEIN CONCENTRATES.		
Meatmeal	80	55	Not quoted		
Linseed Meal	72	25	Not quoted		
Peanut Meal	78	43	Not quoted		
Blood Meal	63	68	Not quoted		
Cottonseed Meal	67	33	Not quoted		
Meat and Bone Meal	68	46	Not quoted		
			ROUGHAGES.		
Lucerne Hay and Chaff	35	15	Hay £10 10s. Chaff £13 10s.	3·21 4·13	Market very strong for chaff and hay
Oaten Hay	35	3	£7 10s. ton	2·29	
Wheaten Hay	35	3	Not wanted		
Oaten Chaff	35	3	£10 10s.	3·21	
Wheaten Chaff	35	3	£9 15s.	2·98	
			MINERAL SUPPLEMENTS		
Ground calcium carbonate (limestone)			None quoted		
Bone Meal			None quoted		
Bone Flour			None quoted		
Shell Grit			None quoted		

Production Trends—October.

Less than average rains were received during October. Dust has been prevalent, and fire risk has increased in all dry areas. Rains are urgently required in all districts except the Darling Downs, where wheat harvesting has commenced.

Harvesting of potatoes has commenced. Wilt and tuber moth have reduced yield prospects in some areas. South Queensland production is estimated at 14,000 tons.

Dairy cattle are mostly holding condition. In a few districts cattle have been moved to agistment. Milk and cream production was increasing at the beginning of October, but declined towards the end of the month.

Sugar cane is cutting well up to estimate, and it is now expected that 6,350,000 tons of cane will be crushed, with a consequent estimated production of 882,000 tons of sugar.

The condition of sheep on the Darling Downs and in the Maranoa and Warrego districts is good, but elsewhere condition has fallen off, with mounting stock losses in the Central and North-west districts.

Brisbane Wholesale Markets—October.

October saw big changes in the prices of peas and beans. Opening at top prices of 6d. and 4d. respectively, they advanced until they were both 1s. 3d. per lb. at the close of the month. Cabbages were practically in glut supply throughout the month. Although quality was of a very high standard, only on the last two days of the month were any sales recorded over 4s. per dozen. Growers marketing tomatoes experienced extremely good prices which ranged to as high as 30s. per half bushel case. The continued scarcity of all root crops resulted in prices remaining at exceptionally high levels.

A continuous decline in the supply of pineapples occurred during the month and for the last two weeks 22s. to 24s. per tropical case was general for best counts. On the other hand, a considerable increase in consignments of papaws, particularly from local sources, occurred, and only special packs made over 8s. per bushel case. The market for bananas remained steady at up to 34s. per tropical case for Cavendish, although during the last week of October there was a noticeable seasonal increase in supplies.

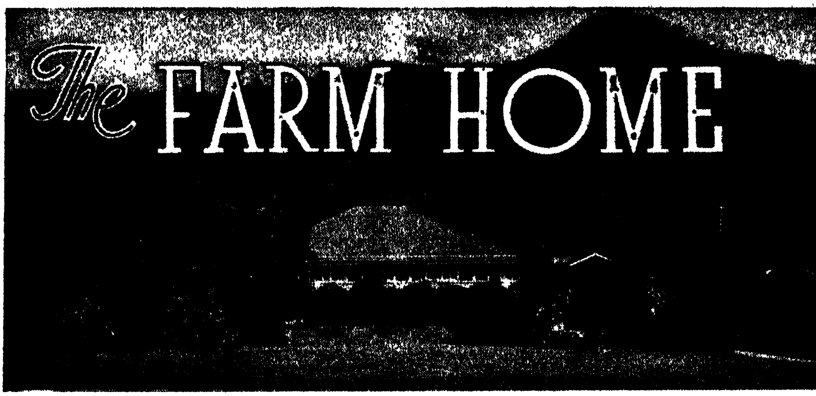
The protracted spell of dry weather throughout many of the northern and western centres of Queensland resulted in a very keen demand for all types of fodder and particularly lucerne chaff and lucerne hay, best quality lots bringing to £16 10s. and £12 10s. per ton respectively. Considerable quantities of new season's onions were on offer. A very keen demand existed for the small percentage of choice onions, but the large majority, which were of medium to poor quality only, were slow of sale at comparatively low rates. The limited quantities of yellow maize received sold at the high prices of 10s. per bushel at opening, increasing to 11s. 6d. per bushel towards the end of the month.

European Recovery.

Apart from coarse grains, where the acreage was slightly larger than during the pre-war period, the acreage devoted to the main agricultural crops in Western Europe for 1946-47 was 8 per cent. lower than before the war. Except for sugar, production of these crops, and livestock population, were fully 10 per cent. below those of the pre-war period. This is stated in an article in the "Economist" of 16th October, 1948.

Most western European governments have embarked on long-term agricultural development schemes, under which, by 1950-51, the area devoted to grain crops and the numbers of livestock are expected to regain, and the area under sugar beet and the numbers of poultry to exceed, their prewar level. One of the main objectives will be the expansion of milk production to slightly above the prewar level. Recovery in meat production is expected to be less marked, and will still be 12 per cent. below the 1934-38 average. During this period, the population of western Europe is expected to increase by 11 per cent.

These plans, which form the basis of the Europeon Recovery Programme, are dependent for their fulfilment on certain assumptions. In the first place, they presuppose an adequate supply of agricultural raw materials—fertilizers, equipment, feeding stuffs, insecticides and seeds. Secondly, they presume the maintenance of East-West trade in Europe. Thirdly, they envisage development of agricultural production in colonial areas.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

THE RIGHT WAY TO BATHE YOUR BABY.

ANY routine procedures in baby care can be the origin of quite serious accidents if not properly carried out. One of these is baby's bath. A mother with a first baby should be taught how to bathe him by her nurse or other experienced person before she undertakes it herself.

Even if she has helped to bathe little brothers or sisters it is advisable for her to check her technique now that she is solely responsible. In these days of small families it is quite usual to find mothers who have never even nursed a baby till their own came along, much less bathed one.

Time to give the Bath.

Baby is usually bathed once a day, although in a hot climate like we have in Queensland two baths a day are often necessary to keep baby cool and comfortable. It is better to give the bath about the same time each day and a convenient time for most mothers is before the 9 or 10 o'clock morning feeding. Baby should not be bathed for at least half an hour *after* a feeding, and in cold weather he should not be taken out of doors for at least an hour after his bath.

Temperature of the Room.

In summer time rooms are usually warm enough (about 75 to 80 degrees) for bathing baby, but on cool wet days in summer and the average winter day some form of artificial heating should be provided, especially for the very young baby. A premature or weak baby requires the room at a temperature of 80 degrees.

Things needed for the Bath.

1. Soap—pure unscented olive oil soap is best.
2. Clean soft towels—at least two—one of which should be large enough to wrap baby in.
3. Soft wash cloths—at least two. These should be washed clean, boiled, and dried daily.
4. Olive oil.
5. A baby's bath tub or large oval bowl.
6. Cotton-wool in a boiled glass jar with screw top.
7. A large bucket or basket for soiled clothing and a bucket for wet and soiled napkins.
8. Bath apron for mother and piece of old blanket and sheet or towel for the bath table.

Preparing the Bath.

Before baby is undressed everything needed for his bath and his complete set of clean clothing should be within easy reach. The tub may stand on the table or on two chairs placed close together.

Mother should wash her hands well and see that her nails are clean, short and smooth. Baby's bath tub should have been scoured and rinsed with hot water. A bath towel placed in the tub, covering the bottom and sides, will prevent baby from slipping and is helpful to an inexperienced mother. Warm water (*never* hot water) should then be put into the tub to a level of 4 to 6 inches. After baby is undressed mother should test the water with her bare elbow and see that it is just nicely warm.

Method of Bathing.

Undress baby, exposing him as little as possible, and wrap him in a bath towel. *Never leave him alone on the table.* No matter how small he is he may roll off.

Dip two small pieces of clean cotton-wool into warm boiled water. Gently wipe baby's eyes, beginning at the corner next to the nose and so outwards towards the temples. Clean the nose with a piece of cotton-wool twisted to a point and moistened with very little boiled water or olive oil. Wet the washer that is to be used for baby's head, wring it out and wash baby's face, using no soap. Dry his face. Soap the washer, wash the scalp and neck and then rinse, holding his head over the edge of the tub. Do not be afraid to wash the "soft spot." Dry the ears carefully, then soap the arms and body all over with the other washer and rinse by lowering baby gently into the tub—feet first—and sponging off the soap. The left forearm should support his head, neck, and shoulders, and the left hand should support his back. Hold his feet with the right hand with one finger between the ankles.

Lift baby gently out of the water and lay him on his stomach on a soft dry towel and cover him warmly.

Dry gently but thoroughly by dabbing with a towel—do not rub hard. Pay special attention to creases in armpits, elbows, groins, &c. If the skin is dried carefully nothing else is needed except a little olive oil round the napkin area.

Dress baby quickly.

Baby's bath should be a pleasant experience, but if he is handled badly, dropped, gets soap in his eyes or is put into water too hot or too cold for him it may start a fear of the bath, and he will be upset and make a fuss each day when bath-time comes round.

If you have any problem in connection with this or other matters connected with children, advice may be obtained by communicating personally with *The Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane,* or by addressing letters *Baby Clinic, Brisbane.* These letters need not be stamped.

IN THE FARM KITCHEN.

Crispy Crust Rhubarb Pie.

Two pounds rhubarb (sweetening to taste), 1 pint tiny bread cubes (neatly cut from slices of stale bread), 3 tablespoons milk, 2 tablespoons sugar. Stew the rhubarb in a teacup of water and sweeten to taste. Put fruit and juice in a piedish and cover with the diced bread. Pour over the milk, sprinkle with the sugar and bake for 20 to 30 minutes till crisp and brown.

Baked Rhubarb.

Baked rhubarb may be made when the oven is cooking some other food. Butter a covered baking dish, spread a layer of rhubarb over the bottom, sprinkle a layer of sugar, then add another layer of rhubarb, and so on until the dish is filled. Sprinkle sugar over the top, then add small pieces of butter and the grated rind of lemon. Cover the dish and bake slowly until the fruit is tender. Long, slow baking gives rhubarb a rich red colour.

Carrot Pie.

Four large cooked carrots, 1 pint milk, 3 table spoons breadcrumbs, 3 oz. to 4 oz. grated cheese, 1 egg, salt and pepper. Slice the cooked carrots into a greased dish. Boil the milk. Add breadcrumbs, grated cheese, seasoning and well-beaten egg. Pour the mixture over the carrots and bake for ten minutes in a moderate oven.

ASTRONOMICAL DATA FOR QUEENSLAND.

JANUARY.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			Minutes later than Brisbane at other places.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.56	6.46	Cairns	48	9	Longreach	43	27
6	5.0	6.47	Charleville ..	29	25	Quilpie	33	37
11	5.4	6.47	Cloncurry	63	36	Rockhampton ..	18	2
16	5.8	6.47	Cunnamulla ..	28	31	Roma	19	15
21	5.12	6.46	Dirranbandi ..	16	22	Townsville ..	40	9
26	5.16	6.45	Emerald	27	12	Winton	51	30
31	5.20	6.43	Hughenden ..	48	22	Warwick	2	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Day.	Rise.	Set.
	a.m.	p.m.
1	6.09	8.30
2	7.08	9.09
3	8.05	9.48
4	9.00	10.13
5	9.53	10.41
6	10.44	11.08
7	11.36	11.36
	p.m.	..
8	12.29	a.m.
9	1.23	12.04
10	2.21	12.36
11	3.22	1.13
12	4.26	1.56
13	5.29	2.47
14	6.30	3.46
15	7.25	4.53
16	8.13	6.03
17	8.55	7.13
18	9.33	8.21
19	10.08	9.28
20	10.41	10.32
21	11.16	11.35
22	11.52	p.m.
23	..	12.38
	a.m.	1.42
24	12.32	2.45
25	1.17	3.47
26	2.07	4.46
27	3.02	5.39
28	3.59	6.26
29	4.58	7.07
30	5.56	8.42
31	6.52	9.14

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	30	11	45	25	20	0	53	28
6	19	19	36	35	10	10	41	40
11	11	27	26	43	1	18	29	51
16	12	28	27	43	2	19	30	52
21	24	15	40	31	15	7	46	35
26	30	9	46	23	21	0	54	26
31	25	14	41	30	10	5	47	34

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	54	6	67	34	51	20	44	7
3	45	14	61	40	46	25	37	14
5	36	24	55	46	40	32	30	21
7	27	34	48	54	33	39	22	29
9	17	38	41	57	26	42	15	33
11	8	48	36	62	21	48	8	40
13	2	55	38	67	17	52	3	45
15	6	53	35	66	20	51	6	44
17	16	45	41	60	26	46	14	37
19	28	33	50	54	34	38	24	29
21	40	21	57	44	42	29	33	18
23	50	10	64	37	48	28	41	10
25	54	3	67	32	51	18	44	4
27	56	8	68	32	52	18	46	4
29	52	8	66	36	50	21	43	8
31	48	18	59	48	44	27	36	17

Phases of the Moon.—First Quarter, 7th January, 9.51 p.m.; Full Moon, 15th January, 7.59 a.m.; Last Quarter, 22nd January, 12.07 a.m.; New Moon, 29th January, 12.42 p.m.

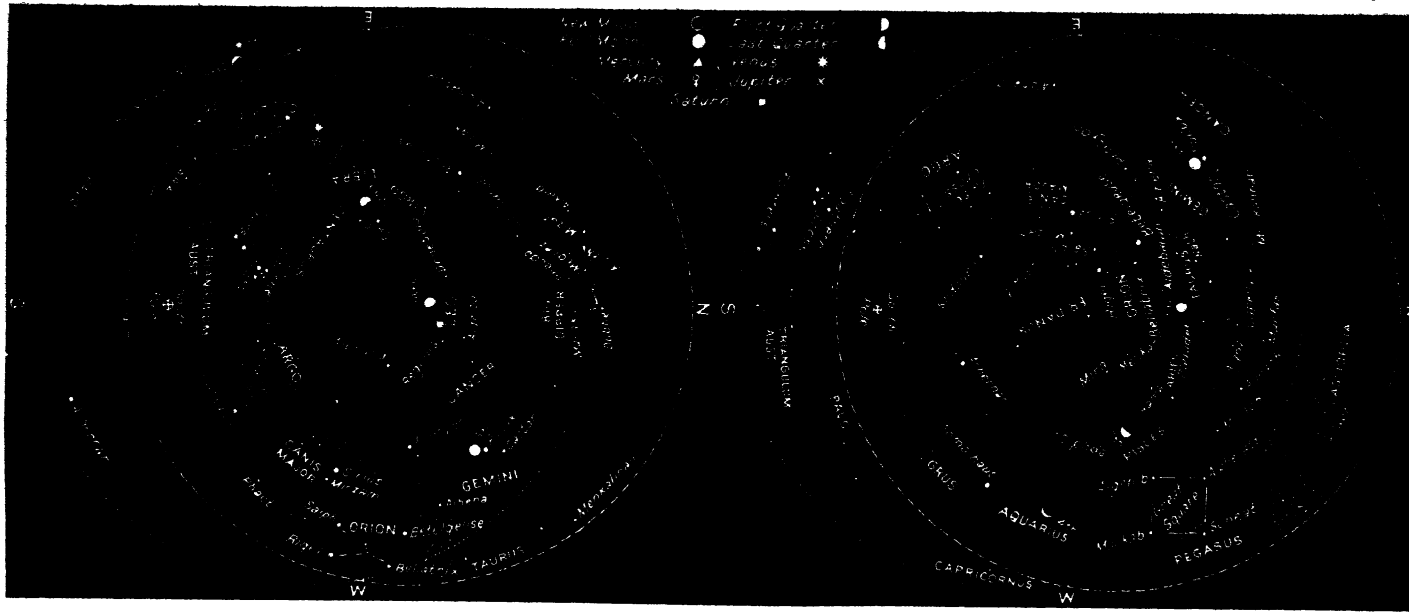
On 15th January the Sun will rise and set 23 degrees south of true east and true west, respectively, and on the 6th and 20th the Moon will rise and set approximately at true east and true west respectively.

On 4h January, at 00 hours the Earth will be at Perihelion—the point in its orbit at which it is nearest the Sun. 91,400,000 miles will then separate these bodies.

Mercury.—At the beginning of the month, in the constellation of Sagittarius, will set 51 minutes after the Sun. On the 8th at 4 a.m. will be in conjunction with Mars and on the 18th at greatest elongation east when it will set about one hour after sunset. On the 28th at 7 a.m. it will again be in conjunction with Mars while on the 31st, in the constellation of Capricornus, it will set only 7 minutes after the Sun.

Venus.—In the constellation of Ophiuchus at the beginning of the month when it will rise between 3 a.m. and 4.15 a.m. About the middle of the month will pass into the constellation of Sagittarius and on the 26th at 6 p.m. will pass about 1 minute to the south of Jupiter which of course will be during our daylight hours.

Mars.—On the 1st in the constellation of Sagittarius, will set about 1 hour after the Sun; while on the 31st, in the constellation of Capricornus, will set 35 minutes after the Sun.



Jupiter.—Too close in line with the Sun for observation at the beginning of this month, being in conjunction on the 1st. At the end of the month however it will rise nearly 2 hours before the Sun.

Saturn.—In the constellation of Leo, on the 1st will rise about 2 hours before midnight and by the end of the month will rise between 7.45 p.m. and 9 p.m.

Star Charts.—The chart on the right is for 8.15, in the south-east corner of Queensland, to 9.15 p.m. along the Northern Territory border on the 15th January. (For every degree of longitude we go west, the time increases by 4 minutes.) The chart on the left is for 7 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars, which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month, the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

THE WEATHER DURING OCTOBER, 1948.

Many stations in all districts received no rain and the period could be classified as one of the driest Octobers on record throughout the State. In the East Downs, Moreton and Metropolitan areas the percentage of Nil reports was abnormally high and many districts would be in the same category as Brisbane where the rainfall of 3 points was the lowest on record for the period of 97 years for which averages have been computed. Some scattered, light and insufficient storms passed across the North-west, Central Lowlands and Central Highlands on the 11th to the 12th but the Upper West and Central Lowlands areas showed a deficit of 40 per cent. and 70 per cent. respectively. All other districts received from 80 to 100 per cent. below normal rainfall, though the South-east and Central Coast received some storms between the 27th and 30th, mainly in the Central Coast and Port Curtis sections, where only 9 reporting stations registered a little over an inch of rain for the month. Stanthorpe with 105 points was the only other district in the State over 1 inch. The wheat areas received approximately 30 points to half an inch on 1st November but in those areas rain is now required as harvesting of an estimated record twelve-million-bushel crop from 550,000 acres had commenced and was being pushed forward to completion as soon as possible. The dry spell had delayed planting of sorghum and other summer-growing crops but cane harvesting results had been very good in most districts. In the dry to drought areas in the West, Central Interior and Tropical areas of the State over average temperatures were generally accompanied by more than normal dust-storm conditions.

In most dairying and farming areas in the South-east quarter an early soaking rain is needed to offset the dry spell since early in September accompanied by frosts and some drying wind periods.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

OCTOBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1947.	Oct., 1948.		Oct.	No. of years' records.	Oct., 1947.	Oct., 1948.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	0·90	42	2·57	0·08	Caboolture	2·73	67	2·68	0·02
Cairns	2·06	61	2·44	0·18	Childers	2·71	48	1·31	0·78
Cardwell	1·95	71	2·73	0·31	Crohamhurst ..	3·38	50	3·20	0·03
Cooktown	1·00	67	0·43	0·00	Esk	2·60	56	2·15	0·00
Herberton	0·93	57	0·81	0·06	Gatton College ..	2·06	44	1·99	0.00
Ingham	1·80	51	0·66	0·00	Gayndah	2·37	72	2·83	0·18
Innisfail	3·12	62	3·24	0·25	Gympie	2·73	73	1·76	0·18
Mossman	2·59	19	2·74	0·34	Kilkivan	2·68	62	1·64	0·00
Townsville	1·25	72	0·11	0·06	Maryborough ..	2·73	72	1·46	0·84
					Nambour	3·23	47	1·94	0·06
Central Coast.					Nanango	2·19	61	3·51	0·00
Ayr	0·87	56	0·11	0·00	Rockhampton ..	1·78	72	0·85	0·35
Bowen	0·97	72	0·24	0·00	Woodford	2·53	55	2·84	0·00
Charters Towers ..	0·71	61	0·19	0·00					
Mackay	1·76	72	0.92	1·12	*Darling Downs.*				
Proserpine	1·53	40	1·10	0·11	Dalby	2·01	73	2·77	0·04
St. Lawrence ..	1·76	72	0·15	0·49	Emu Vale	2·18	47	2·45	0·00
					Jimbour	1·88	64	2·27	0·00
Central Highlands.					Miles	2·00	58	2·85	0·17
Clermont	1·28	72	1·27	0·03	Stanthorpe	2·50	70	4·00	1·05
Springsure	1·62	74	1·85	0·27	Toowoomba	2·54	71	3·17	0·00
					Warwick	2·32	78	3·79	0·14
South Coast.									
Biggenden	2·49	44	2·99	0·00	*Maranoa.*				
Bundaberg	2·07	60	1·22	0·55	Roma	1·73	69	2·27	0·21
Brisbane Bureau ..	2·54	96	3·66	0·03	St. George	1·29	62	3·31	0·40

(Weather and rainfall information supplied by Divisional Meteorologist, Brisbane.)

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11

Contents

THE MINISTER'S NEW YEAR MESSAGE

★ ★

The year which is drawing to a close has provided primary producers with a somewhat mixed grill.

As this message is being written, the last of a record volume of wheat is pouring into the dumps, sugar mills are just finishing crushing a bountiful harvest, and the year's wool sales are ending on a very high tone.

Hon. H. H. Collins

On the other side are the regrettable losses which have occurred in the drought-stricken north-west, the lowered spring and early summer dairy production due to dry conditions, and frost and dry-weather injury to fruit crops.

These varied conditions serve to emphasize the vicissitudes of Queensland agriculture, ups and downs which demand of the farmer and grazier a good deal of skill, fortitude, and perseverance in adversity and balance and foresight in prosperity.

I sincerely hope that by the time this message is read in country homes throughout the State pastures will be green again and field and orchard crops in a flourishing condition.

It is a pleasure to again record my appreciation of the assistance given by primary producers to officers of my Department in their endeavours to advance the science and practice of agriculture in this State. With the continued goodwill and co-operation of producers, further achievement is certain in the coming year.

Not merely increased output, but more efficient and economical production must be the keynote for the future. It is to be hoped that the spirit of the efficiency drive which is about to be undertaken in connection with the Australian dairying industry will permeate other industries possessing inefficiency problems and lead to a reduction in the amount of sub-standard farming.

I take this opportunity of wishing all primary producers the greatest success in their efforts during 1949 and the happiness that comes to the farmer and his family from a job well done.

H. H. Collins

Secretary for Agriculture and Stock.

Field Crops

Sunflowers for Seed on the Darling Downs.

C. S. CLYDESDALE, Senior Adviser in Agriculture, and
J. HART, Adviser in Agriculture.

THE sunflower is a native of northern America, where it was one of the food plants of the Indians. Its culture has now spread to many tropical and sub-tropical countries, but the crop assumes its greatest importance in Russia and the Danubian countries, where the oil extracted from the seed has many domestic and industrial uses and the oil-cake residue, which has a stock food value comparable with that of linseed meal and cottonseed cake, forms an important cattle fodder concentrate.

In America, the sunflower is used largely as a cattle fodder in the form of ensilage in those regions too cold for normal maize production. As a feed, sunflower silage contains less total digestible nutrients than, and is very inferior to, well-matured maize silage. Sunflower silage is also relatively low in palatability. However, it is seldom used as a fodder in Queensland.

Until recent years there has been only a limited local market demand of about 500 to 800 tons of sunflower seed per annum, most of which was absorbed by the bird seed trade. The present shortage of vegetable oils has stimulated interest in the crop and a survey made by the Council for Scientific and Industrial Research indicates that there is a large potential demand for sunflower seed for the production of oil to be used for the following purposes:—

(*a*) As an extender or partial substitute for linseed oil in the manufacture of paints and varnishes, for which purpose approximately 22,000 tons of sunflower seed could be absorbed annually.

(*b*) As an edible oil for use in food processing and preparations. There is a deficiency of approximately 1,500 tons of oil between Australian annual requirements and local production. This deficiency could be made up with 7,500 tons of sunflower seed.

(*c*) Miscellaneous uses, such as in the manufacture of plasticising materials for the rubber trade; cosmetic and soap manufacture could also use greater quantities of this oil.

However, this potential demand of about 30,000 tons of seed is entirely dependent on availability of recognised drying oils such as linseed oil and on its price relative to those of other edible oils. Thus the demand in future years cannot be forecast.

The fixed ceiling price of £32 per ton for graded seed was waived during the 1947-48 season and market values rose sharply to as high as £46 per ton. At these prices the crop is a remunerative one, and while they remain at or near the present level increased acreages can be expected in Queensland.

SOIL AND CLIMATE.

Soil and climatic requirements of the sunflower are somewhat similar to those of maize, but the sunflower will grow successfully on a wider range of soil types and is more tolerant of cool conditions. The sunflower also is generally of quicker maturity. It is this adaptability to poorer soils and colder climates, coupled with earlier maturity, that has given the crop such significant value in the more temperate regions of Russia and America. In America, the sunflower is grown extensively beyond the Corn Belt as a substitute for maize.

The sunflower plant, under normal conditions, is a gross feeder and best results are obtained on deep, rich, friable loams. Sandy soils, when the organic matter is in reasonable supply, also provide favourable conditions. Shallow, stiff, and wet soils are least productive.

SEED-BED PREPARATION AND CROP CULTIVATION.

As well as abundant plant foods, the sunflower plant requires large quantities of water—about 7 gallons for every 1 lb. of dry matter produced—to make its maximum development; preparatory cultivation must, therefore, be early, deep, and thorough. However, sunflowers withstand dry conditions extremely well, being much superior to maize in this regard and thus a surer crop. On a well-prepared long fallow a yield of 1,000 lb. per acre was obtained during the 1946-47 season from a crop on the Darling Downs which received no rain after time of planting. This result instances the value of correct soil preparation and fallowing and the sunflower plant's adaptability to adverse seasonal conditions.

The initial ploughing should be as early as possible and as deep as practicable without inverting the subsoil. The field, particularly if the soil is of a heavy nature, should then be left in the rough, thus allowing rains to penetrate to the subsoil, while surface clods are mellowed down to a friable structure by climatic influences.

Subsequent seed-bed cultivation will be dictated by soil type, climatic conditions, proximity to date of sowing, and the range of implements available. The ultimate objective should be a fairly firm and fairly fine-surfaced seed-bed, similar to that prepared for maize. It is essential that preparation be designed to trap as much moisture as possible. To achieve this, the surface should not be reduced to a fine tilth until immediately before sowing. Weed growth should be kept in check in the earlier stages with stirring types of implements, which will assist in keeping the soil open and pervious to rain, rather than discs, which should be used only if weeds threaten to get beyond control or if a rough surface cannot be broken down sufficiently quickly.

During growth, inter-row cultivation may be necessary to keep down weed growth up to the time the rapidly growing sunflower plants

cover the ground sufficiently to check such competition. Care should be taken during the inter-row cultivations, especially the second, which is normally also the last, to ensure that damage is not inflicted on the root system, which spreads rapidly across the inter-row spaces.

PLANTING.

Sowing may commence as soon as fear of frost is over and may be continued into January of the following year. However, December and January plantings are often subject to rust attack and, therefore, the early planting is recommended. One disadvantage with early planting is that the crop tends to ripen during the wet, stormy season and thus harvesting operations may be interrupted or delayed.

The rate of sowing and the spacings to be used are dependent on the intended method of harvest—that is, whether by hand or by mechanical means. If the latter method is to be used, sowing at the rate of 4 to 5 lb. of seed per acre, in rows 35 inches apart, is recommended. This rate allows good plant development and yet tends to keep the number of coarse-growing plants down. The 35-inch spacing, besides favouring crop growth, is a convenient planting and harvesting spacing and is the minimum practical planting distance which allows combine-drill* inter-row cultivation.

If the crop is to be harvested by hand, a planting rate of 2 to 3 lb. per acre in rows 4 feet to 4½ feet apart is suggested. This lower seeding rate, by reducing the plant population of the field, allows vigorous plant development with the production of large, heavy seedheads. Thinner stands of this type are most suitable where hand harvesting is practised.

The crop can be planted either with a combine-drill or a maize planter. Plants usually average 12–18 inches apart within the drills. Planting at 15 inches apart in drills 4 feet wide would require 2 lb. of seed per acre. When the crop is to be harvested by mechanical means, planting round and round the paddock is recommended as it is then a simple matter to follow the rows with the header-harvester.

VARIETIES.

The giant sunflower has been grown in Queensland for many years but increased attention is now being given to dwarf varieties, which are more suitable for mechanical harvesting and can be handled entirely by normal wheat farm machinery.

The table below gives bushel weights and seed-oil contents of samples taken from a Departmental varietal trial conducted on the Darling Downs during the 1947-48 season—

Variety.	Bushel Weight.	Oil Content.
	Lb.	Per cent.
Giant Russian	32¼	27·1
Mennonite	22	23·5
Sunrise	29¼	28·8

* Combination seed drill and tyne cultivator used principally in the wheat-growing areas for sowing of all types of seed.

Giant or Mammoth Russian.

This was the principal variety introduced into Queensland, but the indiscriminate selection of seed has given rise to a mixed type with few uniform characteristics. Certain growers have made selection for size of head and appear to have included such characteristics as height of plant and colour of seed, so that to-day a number of strains occur throughout the State. Giant Russian has a medium-sized, grey-striped seed (Plate 106), with some strains producing pure black seed.

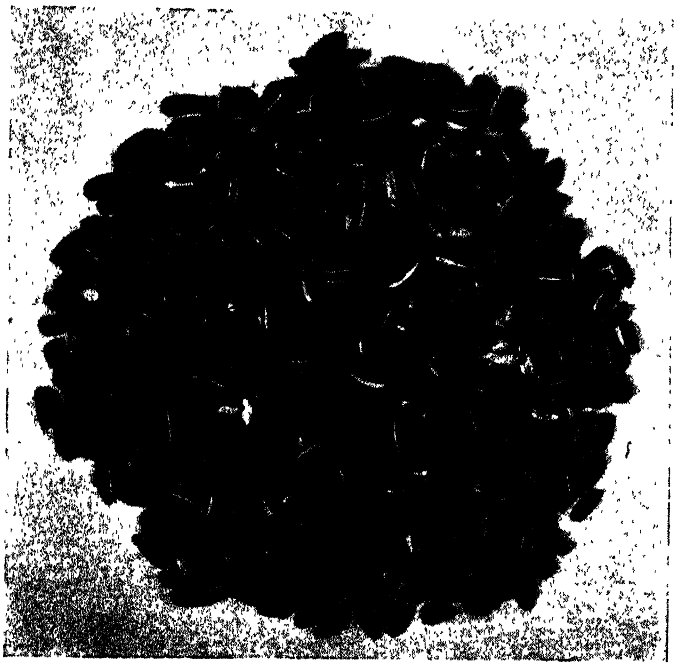

Plate 106.

SEED OF GIANT RUSSIAN SUNFLOWER.—The average seed dimensions are $\frac{7}{16}$" to $\frac{1}{2}$" long by $\frac{1}{4}$" broad.

It is a very vigorous variety, often exceeding 10 feet in height and developing heads up to 1 foot in diameter. It is a high yielder, averaging in the vicinity of 1,000 lb. per acre, but yields of 1 ton per acre are not uncommon. Because of its robust habit of growth (Plate 107), this variety gives best results when planted at the wider spacing and at the lighter seeding rate, thus allowing full development of individual plants. In the Warwick-Killarney district, where hand harvesting is still practised, this is the principal variety grown.

Giant Russian can be satisfactorily handled by the header-harvester, but if the stand is unusually heavy it may be advisable to take only two rows, or even one row, at a time with the harvesting machine.

Mennonite.

Although a dwarf variety, Mennonite under ideal conditions may grow as high as six feet. The heads are markedly pendulous and this characteristic seems to be responsible for the tendency of Mennonite to

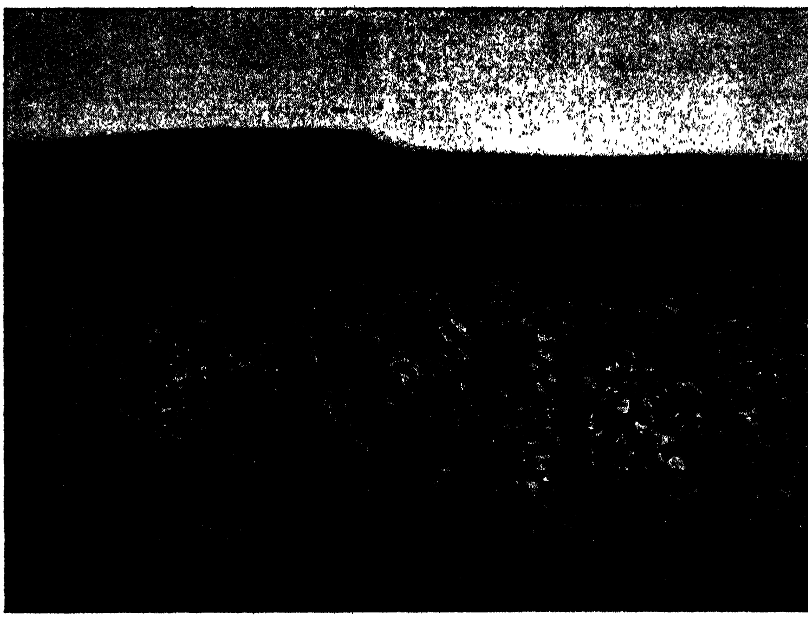

Plate 107.
A CROP OF GIANT RUSSIAN SUNFLOWER IN THE CAMBOOYA DISTRICT.

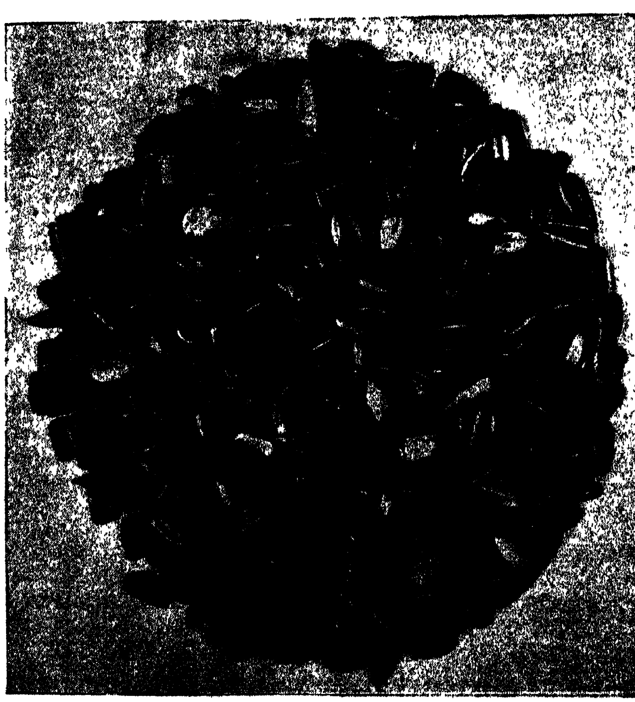

Plate 108.
SEED OF MENNONITE SUNFLOWER.—The average seed dimensions are $\frac{9}{16}$″ long by $\frac{4}{16}$″ broad.

"go down" if heavy rains fall during the ripening stage. Lodging occurs in all varieties but appears to be more common in Mennonite. As maturity approaches, the head in most strains of sunflowers becomes lighter and the bent stalk gradually straightens itself to near its former upright position. In Mennonite, however, this upright position is often not regained, due to the partial fracture of the stalk during the period when the head is at its heaviest and causing pronounced bending of the stalk. This characteristic suggests a weakness of stalk in the variety which is not desirable from the point of view of mechanical harvesting, as the comb would have to be lowered below normal cutting height to gather most of the hanging heads. However, this variety, because of its partial dwarf habit, is now becoming popular on the Darling Downs, where yields to date have averaged 750–1,000 lb. per acre. The heads are medium-large in size and bear large, elongated grey-striped seeds (Plate 108).

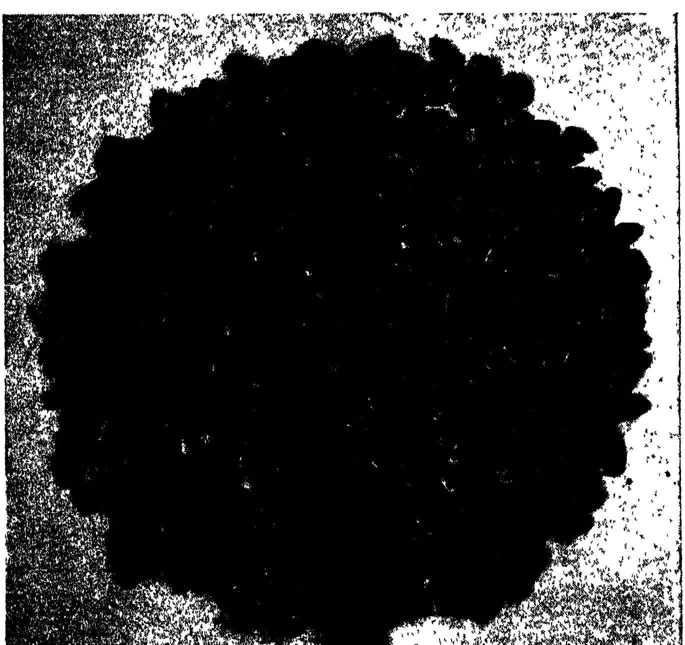

Plate 109.

SEED OF SUNRISE SUNFLOWER.—The average seed dimensions are $\frac{3}{8}''$ long by $\frac{1}{4}''$ broad.

Sunrise.

Although not yet grown commercially to any extent in Queensland, this variety is promising. In appearance, it seems more leafy than other varieties, but this is probably because of its dwarf habit; it is only $3\frac{1}{2}$ to 4 feet in height. It carries well-formed heads with a diameter of six to eight inches and bearing small, plump, dark-grey-striped seeds (Plate 109). The head of Sunrise is quite distinct from other varieties, for when mature the bracts at the base of the head remain fairly straight and regular while in Giant Russian and Mennonite the bracts become

curled and irregular in appearance. Furthermore, the mature head retains its seed reasonably well, while in the other two varieties the seed shatters if the plant receives a slight jar or if the head is handled.

The height of this variety renders it particularly suitable for mechanical harvesting. Moreover, it could probably be effectively handled by the lighter type of header-harvester which is unsuitable for handling tall varieties.

Advance.

Advance is a hybrid introduction from Canada, where it has become most popular, and is reported as possessing a high oil content. It is similar in appearance to the Sunrise variety, growing to approximately the same height and having a seedhead of similar size. The parent seed itself, however, is of medium size and more grey-striped than Sunrise (Plate 110).

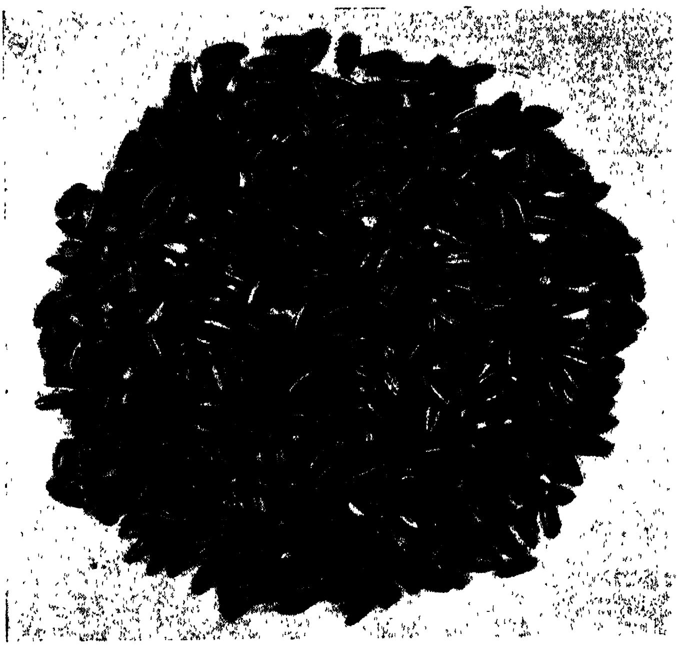

Plate 110.

SEED OF THE FEMALE PARENT OF ADVANCE, A HYBRID SUNFLOWER.—The average seed dimensions are $\frac{7}{16}$" long by $\frac{7}{32}$" broad.

HAND HARVESTING.

The heads should be thoroughly dry before harvesting commences. Where hand harvesting is followed, the heads are usually cut with pruning shears and then thrown into a wagon, dray or other vehicle which has been lined with sheets of bagging or other suitable material to retain any loose seed which may be shed. The heads are then carted direct to the thresher.

The seed is easily removed, the grain header used as a stationary thresher being the most convenient machine for threshing sunflower

heads. Any type or make of header will thresh the seed, but different modifications are required according to the type of drum in the header to be used. With a peg drum, adjustments on the principles outlined in (*d*) and (*e*) of the section devoted to mechanical harvesting should suffice, whilst with the bar drum the concave should have all bars removed and should be opened to its fullest extent. The drum should be slowed down, and the fan draft increased. The rate of threshing will be controlled by the capacity of the riddle to handle the refuse, most of which escapes the straw-walkers.

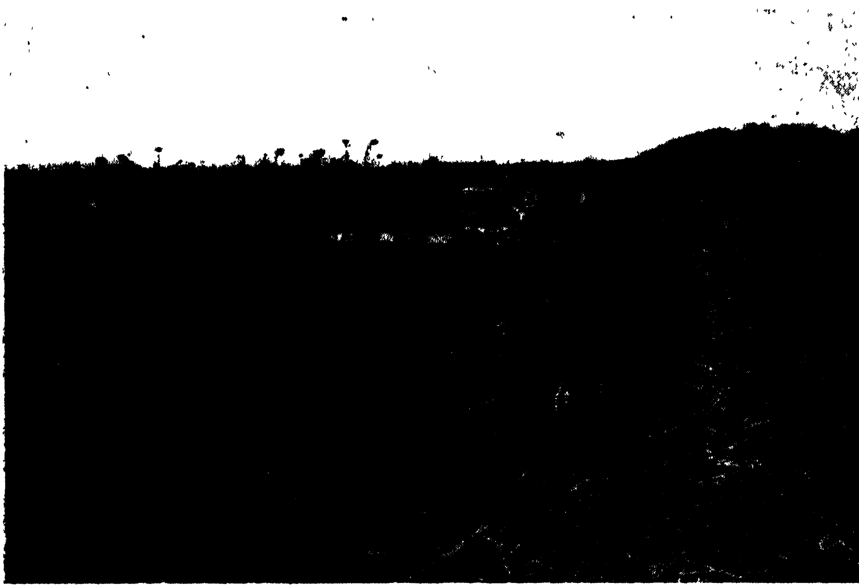

Plate 111.
A MODIFIED HEADER TAKING OFF A 22-BAG CROP.

MECHANICAL HARVESTING.

Sunflowers have been successfully harvested by header-harvesters on the Darling Downs for a number of years (Plate 111). Header modifications and adjustments vary for individual crops, for the various makes of machines and according to the ideas of individual growers, but basically all machines are modified similarly.

Although ground driven machines can be used, the power driven are by far the most satisfactory, for, in addition to being much easier to pull, they allow the machine to work at a much slower speed. A slow-moving header is much less likely to jar and knock the ripe plants, causing seed loss, than is a header moving at three miles per hour, which would be the minimum speed to give the necessary power in a ground driven machine.

As an illustration of alterations to a header-harvester which have given very satisfactory results in harvesting sunflowers, the following details are quoted by courtesy of Mr. D. Binney, Cambooya, who operates a 1939 model 12-foot Horwood Bagshaw header-harvester drawn by a W6 McCormick-Deering tractor (H.P. 24·7).

Modifications and adjustments can be divided into five groups as hereunder:—

(*a*) Addition of trays and finger covers;
(*b*) Comb;
(*c*) Reel;
(*d*) Threshing drum;
(*e*) Minor adjustments.

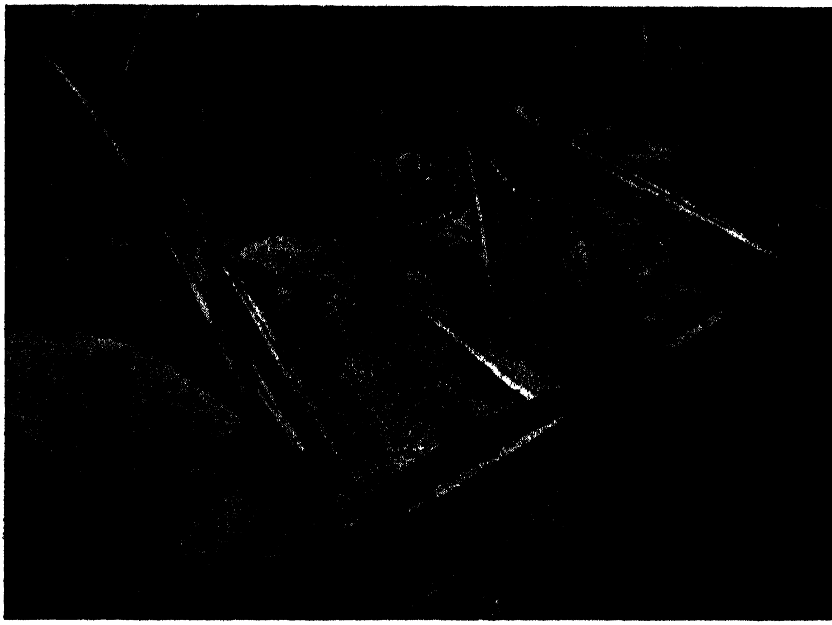

Plate 112.
VIEW OF TRAYS ATTACHED IN FRONT OF COMB.

(*a*) *Addition of trays and finger covers.*

Trays are simply large fingers which protrude with a slight upward tilt to 7 ft. 6 in. in front of the comb and have the double function of catching falling seed and seedheads and of guiding and assisting the stalk and head on to the comb (Plates 112 and 113). The end of each tray is shaped into a point so that bent stalks and heads hanging in the middle of the row can be gathered in, and in addition this shape allows for any slight discrepancy in row spacing which may occur when the crop is planted.

The trays are made of 20-gauge galvanised iron with an upturned lip of 1 inch on all sides except the base, which is attached to the comb. This lip not only retains any seed that may fall on to the tray but also helps to strengthen the tray. These galvanised trays can be further strengthened by the use of 1-inch flat iron or angle iron to enclose the whole of the lipped edge. Because of extra firmness, angle iron is preferred and in this case a lighter gauge galvanised iron can be used

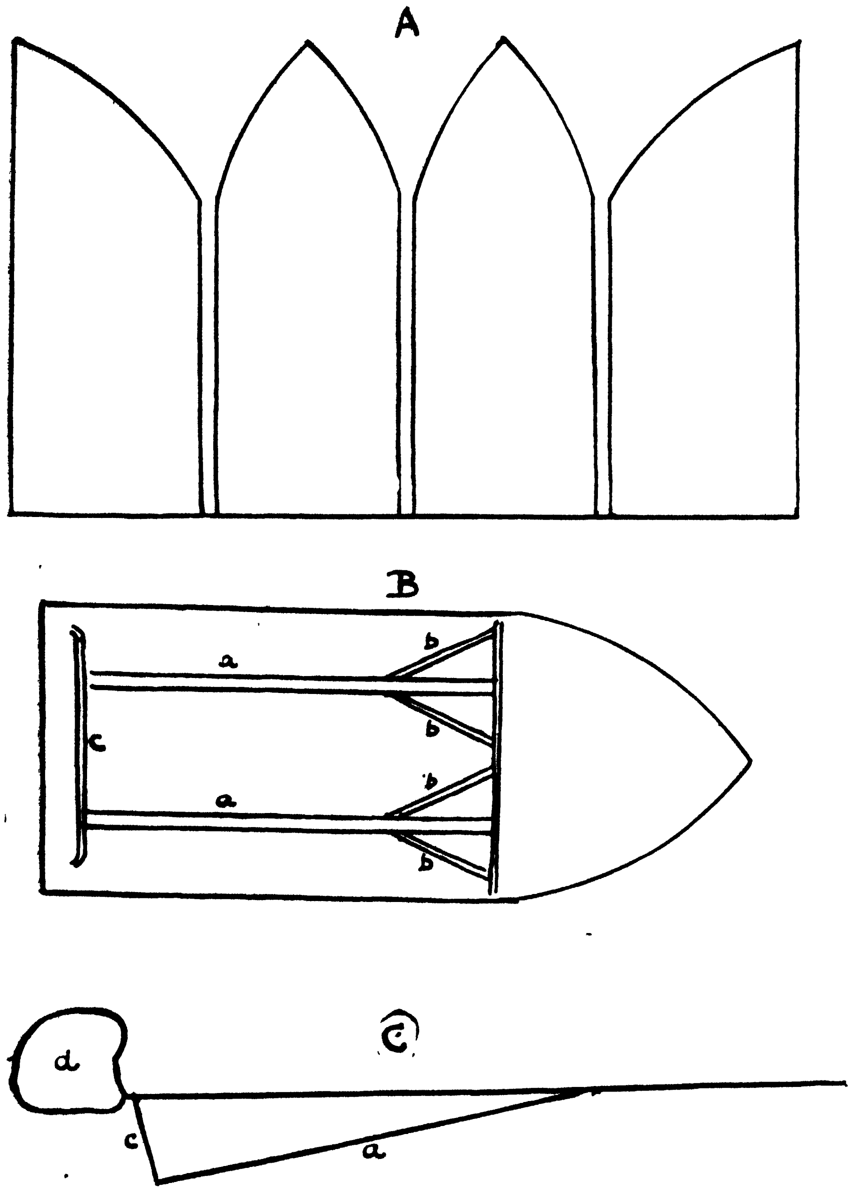

Plate 113.

DIAGRAMS (not to scale) SHOWING TRAYS AND THEIR ATTACHMENT.—A: Four trays approximately 3 feet wide on a 12-feet header. B and C: Showing how the tray is stayed and attached. *a*, 3-inch hardwood stays; *b*, 1-inch flat-iron stays; *c*, iron U; *d*, end of comb.

for the trays, thus reducing the strain on the comb. Steadiness of the trays is a very important factor if seed loss is to be minimised during their passage through the crop.

The base of each tray is placed on top of the fingers and attached thereto by small bolts so that the basal edge of the tray just covers the

cutting knife. Each tray is independently stayed underneath by means of wood and flat iron, or preferably, wholly by angle iron. These stays can be set in a number of ways to achieve firmness.

The finger covers are also made of 20-gauge galvanized iron and attached underneath each tray. Each cover is made about the same width as its corresponding tray, to which it is attached about one foot in front of the comb fingers, and extends towards, and ends at, the base of the fingers. The purpose of these finger covers is to prevent the pointed fingers from gathering stalks and rubbish which normally pass under the comb.

Plate 114.

THIS ILLUSTRATION SHOWS THAT THE HEADER CAN HANDLE AN ENORMOUS BULK OF WASTE.

(*b*) *Comb.*

The only adjustments necessary to the comb are, firstly, the removal of the fingers in the spaces between the large trays and, secondly, the erection of a guard strip of galvanised iron about 30 inches high extending in an upright position from the front of the comb to about 48 inches along the outer edge of the tray nearest to the elevator.

This vertical guard helps to keep the stalks on the trays and prevents them from falling on the machine itself.

(*c*) *Reel.*

The reel is raised approximately one inch above its normal setting. This increased clearance not only allows for the greater width of the sunflower stalks but is necessitated by the upturned lip on the edges of the trays. This lip is one inch high, and it is essential that the reel has

normal clearance above it. To obtain such clearance, fresh holes need to be drilled in both ends of the reel support in which the axle of the reel revolves.

(*d*) *Threshing drum.*

Best results are obtained by removing the concave pegs from the concave floor; or, if the crop is light, by setting back the concave pegs to their full extent. This modification prevents seed damage.

A desirable but not altogether necessary adjustment is the removal of the six drum thresher bars and the substitution of three plain bars with only three raised pegs on each bar. This modification prevents excessive breaking of the seedhead and permits a greater proportion of the refuse to pass over the straw-walkers, thus reducing the congestion of refuse and the strain on the riddles.

Plate 115.
THE THRESHER AT WORK.

(*e*) *Minor adjustments.*

As required for all other crops, minor adjustments of the header-harvester are also necessary for the harvesting of sunflowers to correct for height of plants at maturity, thickness and peculiarities of individual crops and so on. For example, the blast can be reduced to a minimum or may need to be completely shut off. Again, in some instances it may be necessary to give additional clearance to the comb spiral, whilst again the selection of certain riddles may be required for different varieties and for different crops. The length of shake on the riddles may also need adjusting, but, in general, the shorter the shake the more satisfactory is the result.

Under normal conditions, taking a three-row cut and with the tractor in low gear, seven or eight acres a day can be handled.

With correct adjustments and with a fully ripe crop, there should be no need to grade the seed. Some difficulty may be experienced, however, in securing a good clean seed sample if the crop is not at the right stage of maturity.

To avoid waste and to facilitate machine harvesting, it is preferable to hand-cut the four corners through to the centre of the paddock before the main harvest commences. These heads can be fed direct into the header from heaps in the field. Plate 115 shows the residue where one of these heaps has been threshed in the field.

DISEASES AND PESTS.*

Sunflowers grown in Queensland generally show the presence of a rust. This disease, which is caused by a fungus† can become quite serious and reduce crop yields to an unpayable level. The rust appears on the leaves as brown spots, on the surface of which are borne the spores of the fungus. Leaves on which rust spots are numerous shrivel and drop and this interferes with the development of the seeds. Late planted crops are generally more severely rusted than the earlier ones. As the early crops escape serious injury, control of the disease is obtained by planting before December.

A white rust frequently appears on sunflowers. This is due to another fungus‡ and is of more interest than importance as it has not been known to cause serious crop losses. The name is descriptive of the disease, in which clusters of white spores form white spots on the leaves. Wilt, due to a soil inhabiting fungus,§ is more serious. The fungus invades the plant at about soil level, setting up rot of the base of the stalk and adjacent roots. Affected plants are a total loss. To avoid trouble from this disease, sunflowers should not be planted in poorly drained land nor planted frequently in the same paddock.

Although insects are not usually a limiting factor in the cultivation of sunflowers, certain pests that are notorious for their damage to a wide range of plants may temporarily transfer their attention to this crop.

The establishment of a uniform stand may be governed by the activity of soil insects and notable among these are wireworms. These beetle larvae are found in the soil and may occur in numbers in certain localities, causing damage to seedling roots. The routine application of control measures would not be warranted unless it had previously been established that a particular soil type was prone to wireworm infestation. If such should be the case, BHC 10 per cent. dust, which has proved very effective for wireworm control, should be applied as a soil dressing before seed sowing.

The green vegetable bug,¶ a notorious pest of leguminous crops and tomatoes, will also attack sunflowers. Large numbers of adult bugs per

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* Notes supplied by R. B. Morwood, Senior Pathologist, and A. W. S. May, Entomologist.

† *Puccinia helianthi* Schwein.

‡ *Cystopus* sp.

§ *Sclerotinia sclerotiorum* (Lib.) de Bary.

¶ *Nezara viridula* L.

head may cause malformation of the flowers and faulty setting of seeds. Control measures are rarely warranted against this pest, but where populations are high and damage likely to occur the application of DDT, either as a 0·1 per cent. spray or a 2 per cent. dust, will control the infestation.

The Rutherglen bug* is normally of little importance in this crop. Occasionally, however, it breeds rapidly on certain weeds and the adults migrate to various cultivated plants. They readily attack sunflowers, causing yellowing, scorching, and eventual death of plant parts. The destruction of their normal weed hosts suggests itself as an obvious method of control, but during epidemic years reinfestation of the area soon occurs and some form of insecticidal control is required in addition to general cultural control measures. Like the green vegetable bug, this pest is controlled by applications of DDT in either spray or dust form.

Aphids are commonly associated with sunflowers but rarely attain serious proportions. Parasites and predators play a big part in controlling outbreaks of the pest and it is doubtful whether specific control measures would be warranted in this crop.

Although the various pests mentioned above may occur quite frequently in sunflower crops, they only occasionally attain importance as a limiting factor in crop production. The advisability of applying insecticidal control measures must be weighed from a number of angles and the cost of materials, labour and equipment required taken into consideration. The availability of efficient and easily handled equipment will be a big factor governing the feasibility of applying insecticides to this crop.

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* *Nysius vinitor* Berg.

New Weed Thistle.*

A thistle with a bad reputation in the south has recently appeared in the Fassifern district. Farmers in southern Queensland should watch for the occurrence of this thistle and grub it out before it seeds.

The plant is two to three feet high and extensively branched. Its leaves are dull green, about two inches long and deeply lobed. The flowers are lilac or pale purple and surrounded by a mass of spiny bracts. Seed usually ripens about January.

The name star thistle given to this plant is applied also to two yellow-flowered thistles, but these are annuals, whereas the purple-flowered thistle lives for two years or longer.

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* *Centaurea calcitrapa.*

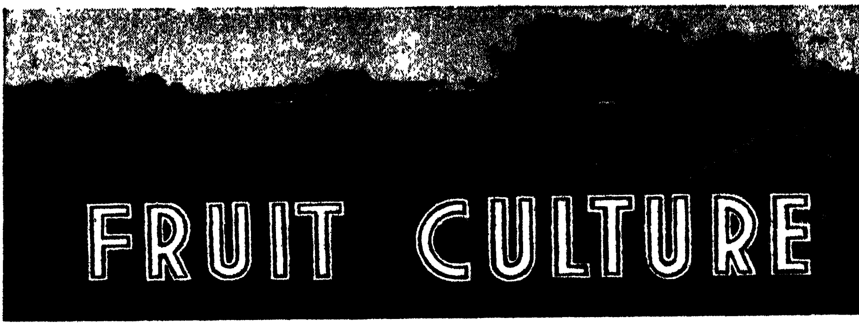


Fig Growing in Queensland.

R. L. PREST, Senior Adviser in Horticulture, Horticulture Branch.

COMMERCIAL fig growing in Queensland has, principally due to economic factors, been confined to the neighbourhood of Brisbane, but figs are grown in the home garden in many parts of the State. The main outlet for the commercial grower is for jam making, but small quantities are marketed as fresh fruit.

CLIMATIC CONSIDERATIONS.

When grown under humid conditions such as are experienced in the coastal areas, figs are very perishable and are liable to sour and ferment within a short time after picking. Therefore, the prompt utilisation of the fruit as it ripens is necessary, thus confining its usefulness to marketing as fresh fruit close to the centre of production, and for preserving or canning.

Conditions required for the dried fig industry are long, sunny days, high temperatures, and relatively low humidity. Though some of these conditions exist in parts of our semi-arid regions, adequate irrigation facilities are essential before a dried fig industry can be established, consequently no development of fig growing has taken place in such areas. In addition, frost hazards would require careful consideration, for though the fig tree is deciduous, young trees are susceptible to frost injury.

SOILS.

In Queensland, figs are found to be thriving on a comparatively wide range of soils, such as sands, sandy loams, and loams, all of which are regarded as suitable, provided they are well drained.

Generally, light sandy soils lack fertility. Their humus content is low and their moisture-holding capacity poor, and as a consequence they can be expected to become very hot and dry during the summer months. Under such conditions, irrigation and ground coverage with a suitable green crop are necessary soil management practices.

Sandy loams are usually more fertile than sandy soils, with a higher humus content and a much better moisture-holding capacity.

Loams, though not always well drained, possess some desirable qualities. Usually they are fairly fertile and well supplied with humus, though not necessarily so; hence they are not so seriously subject to the effects of drought or high soil temperatures.

NOTES ON BOTANICAL CHARACTERS.

Botanically, the common fig belongs to the genus *Ficus*, and is a member of the mulberry family. The home of the cultivated species is the semi-desert regions of Asia.

The fruit is a fleshy, hollow receptacle bearing flowers on the interior surface. At its apex is an opening which is more or less closed by scales. Within some of the receptacles of most species of *Ficus* are to be found various species of insects whose larvae develop from egg to adult inside individual flowers. A fig flower, the ovary of which contains the egg or larvae of a fig wasp, is termed a gall flower. When the fig wasp emerges from the flower and leaves the fruit, it may be dusted with pollen if the staminate flowers near the opening or mouth are mature. Such pollen is deposited in other figs which the insect enters for the purpose of egg-laying, and so pollination is effected.

CLASSIFICATION.

For horticultural purposes the fig may be divided into four general types—namely, Caprifig, Smyrna, White San Pedro, and the Common fig.

Caprifig.

This is a primitive type of the cultivated fig. Its useful purpose horticulturally is the part played by it as the host plant for the Blastophaga or fig wasp.

Smyrna.

This type of fig includes those which require to be pollinated by an outside agency. This may be readily brought about by placing mature figs of the Caprifig in the trees of the Smyrna type. From the former the pollen-dusted fig wasps emerge and then enter the Smyrna figs, thus effecting pollination. This operation is called caprification.

White San Pedro.

This type combines the characteristics of both the Smyrna and the Common type on the one tree. The first crop figs are of the Common type and develop without pollination of the flowers; the second crop figs are of the Smyrna type and must be caprified if they are to reach maturity.

Common.

The Common type does not require to be caprified. All the varieties grown in Queensland, of which Brown Turkey, Brunswick, Cape White, and White Adriatic are the best known, belong to this group. Hence growers in this State do not have to concern themselves with the problem of caprification.

VARIETIES.

Adriatic (White Adriatic).

This is one of the principal drying figs, though the dried product is not considered to be of the highest quality. In Queensland, where it is grown as a fresh fruit, plantings have been mainly confined to the home garden. The trees are vigorous and very productive. The main crop figs are medium to large in size and variable but generally spherical in shape; they are usually green in colour, but when grown

in coastal areas green with a purplish tinge. The pulp may be light to deep strawberry in colour, and the flavour is considered to be excellent. The crop matures in February and March.

Brown Turkey.

This is the principal variety grown in Queensland, and is particularly favoured for coastal areas. The tree is large and vigorous, and under favourable conditions crops well. The fruit is medium to large in size and obliquely pear-shaped; the ribs are fairly prominent and usually more deeply coloured than the rest of the fruit, and the eye is large and open. The fruit is purplish-brown in colour, with lighter shades towards the neck and base. The flesh is pinkish-brown, with a hollow centre and numerous seeds of medium size. Tree-ripened fruit is of excellent quality and flavour and is favoured on the fresh fruit market. The season is February to April.

Brunswick.

This variety is mainly confined to the home garden in Queensland. The tree is considered to be less vigorous than Brown Turkey, and the fruit has a tendency to crack. The main crop fruits are of medium size, spherical to top-shaped, with well-defined ribs. The mature fruits are reddish-brown in colour, with the pulp amber coloured and seedless. The flavour is sweet. Fruit ripens in Queensland in February and March. Caprified Brunswick figs are above medium in size, purplish-brown in colour, with deep strawberry flesh and large fertile seeds.

Cape White.

This is a recent importation from South Australia, where it is greatly favoured by the trade for jam purposes, mainly because of the attractive golden colour of the manufactured product. The trees are small, compact, and vigorous, and are heavy croppers. The fruit is small, squat pear-shaped, and practically neckless. It is slightly ribbed and has a small open eye. The colour at maturity is yellowish-green, with a darker shading along the ribs. The flesh is creamy-white, with a solid centre, and the numerous seeds are white to brownish in colour. This is an early variety, the fruit maturing in December and January.

Genoas.

These are sometimes listed by nurserymen. They do not require to be caprified.

Black Genoa is a large, purplish-black fig with a reddish flesh. It matures somewhat earlier than the Brown Turkey but is not so prolific.

White Genoa is a large, pear-shaped variety with a waxen yellow skin. The flesh is amber and sweet. This variety crops well in coastal districts.

PROPAGATION.

In this State fig trees are propagated from cuttings. The cuttings are made during the dormant period from well-matured wood of the previous season's growth. The long slender sappy growths which sometimes sprout from the ground should not be used.

The centre of the wood used for cuttings is pithy, except at the nodes, that is, the points where the leaf stems are attached. Here the wood is solid, and it is from these points that roots are put forth.

In making cuttings the lower ends should be severed below the bottom node, and the top just above the top node. The length of the cutting is governed mainly by the vigour of the growth and the distance between nodes, and is ordinarily about 8 to 10 inches.

When cuttings are made in the late autumn they are heeled in moist sand in a cool, shady place, where they remain dormant until they are required for planting in late winter or early spring. Cuttings made during late winter or early spring are planted straight to the nursery row.

In planting to the nursery row, furrows are opened and cuttings spaced at from 9 to 12 inches apart in an upright position. One bud or node should remain above ground level, so that the depth at which the cutting is planted is largely governed by its length. The soil should be carefully firmed around each cutting. Under favourable conditions cuttings should develop into suitable trees in one season.

PLANTING.

In districts with comparatively mild winters, figs may be planted from autumn through to spring, providing the trees are completely dormant at the time of planting.

The number of fig trees to the acre depends on the variety, the fertility and moisture-holding capacity of the soil, and the amount of water available from either irrigation or rainfall. In coastal Queensland, planting on the square (Plate 116) at from 25 to 30 feet apart has generally been adopted.

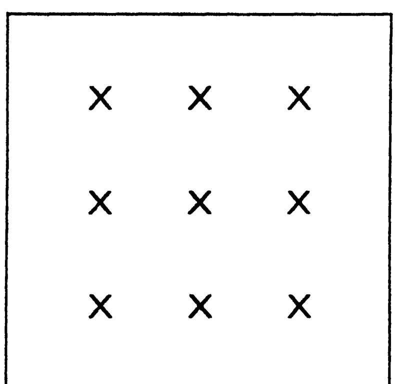


Plate 116.
DIAGRAM OF SQUARE SYSTEM PLANTING.

The following table gives the approximate number of trees to the acre when planted on the square.

Distance Apart in Feet.	No. of Trees per Acre.
25	70
26	64
27	60
28	55
29	51
30	48

In order to calculate the number of trees required per acre when planting on the square system, multiply together the distance apart in feet and divide the result into 43,560, the number of square feet in an acre.

The first essential in planting an orchard is to plough thoroughly and subsoil, always, however, avoiding bringing the subsoil to the surface. This can be done by ploughing the furrow in the usual way and following by a subsoiler to loosen up the bottom of the furrow before the next sod is turned. Ploughing should be followed by harrowing, working down, and grading.

Having decided on the distance at which the trees are to be planted, the next step is to measure the longest side of the proposed orchard and use it as a base line. This should be measured from at least 30 feet inside each boundary in order to leave ample headlands for turning purposes.

The base line is marked out by the use of a length of fencing wire fitted with rings at each end, and with small buttons of solder fixed at distances along its length corresponding with the distance apart the trees are to be planted. When the base line is struck and the wire drawn taut, pegs should be driven into the ground at the buttons on the wire.

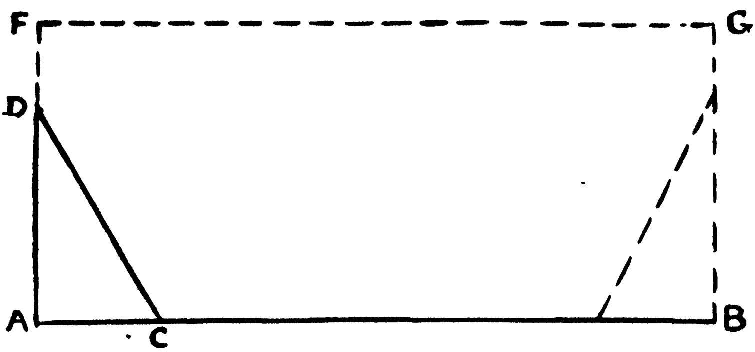


Plate 117.

DIAGRAM ILLUSTRATING THE METHOD OF LAYING OUT A RECTANGULAR ORCHARD.

The simplest way to lay out a right angle is by the 3–4–5 method. For accuracy, it is better to work with multiples of these figures, and the following procedure is recommended (refer to Plate 117.)

AB is the base line, and a line is to be laid off at right angles to *AB*, at *A*.

With a box tape, measure 15 feet along the base line *AB* to the point *C* and peg. Secure the ring of the tape at *A*, get a second person to hold the 45-feet mark at point *C*, take the 20-feet mark on the tape, and walk back until the tape tightens equally from both ends. The line joining this point *D* to *A* is exactly at right angles to the base line *AB*, at *A*.

The two side lines *AF* and *BG*, at right angles to the base line *AB*, are run out. Complete and stake the fourth side of the rectangle and

then stretch the planting wire from the second stake on the base line to the second stake on the fourth side *FG*, stake, and then move the planting line to the third peg, and so on until the field is completed. If the right angle was set out correctly and the wire strained equally taut throughout, the rows of stakes will be in line in every direction.

To ensure that the young trees are placed exactly in the position occupied by the pegs, a planting board will be found useful and is easily constructed. A board some 4 or 5 feet in length, 4 or 5 inches in width, and 1 inch thick is used and a "V" notch out in the centre and a similar notch at each end. (Plate 118.)

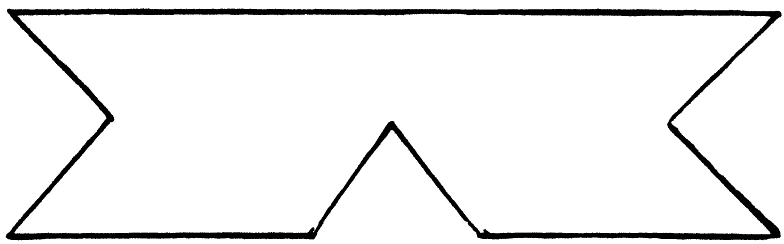


Plate 118.
METHOD OF NOTCHING PLANTING BOARD.

In use, the centre notch is placed against the peg denoting the position of the tree, and pegs are driven in at the notches at each end of the board. The board and middle (tree) peg are then removed, leaving the end pegs in place. The hole to receive the tree is then dug. The board is then brought into use again, being fixed as before at ordinary soil level between the two remaining pegs. The tree is placed in the hole at the centre notch in the board, taking the position formerly occupied by the middle (tree) peg, and the soil filled in.

The planting board serves another purpose in that it ensures planting the tree at the proper depth. The correct depth at which to plant the tree is the depth it was grown in the nursery; the mark can usually be distinguished on the tree.

In digging the holes for the trees the surface soil should be taken out and kept on one side. The subsoil at the bottom of the hole should be finely broken up. Provided the orchard has been properly prepared, there is no need to dig deep holes; so long as they are large enough to space the roots without cramping, they will serve the purpose. A little topsoil may be returned to form a small mound at the bottom of the hole. The roots, which just prior to planting should be carefully washed and trimmed, should be spaced as evenly as possible, and, with a downward and outward slope of from 40 to 45 degrees. The spaces are then filled in with fine soil which is pressed down firmly. Water is applied and allowed to soak in before the hole is completely refilled with soil.

PRUNING.

The main objects of pruning fig trees are the training of young trees, the removal of undesirable limbs, the modification of form to meet cultural requirements, and the encouragement of the production of vigorous new wood for bearing main-crop figs over a long season.

The fig tree normally bears two crops each year, the first crop appearing on wood of the previous season's growth and the second or main crop on new wood of the current season's growth. As it is this latter crop in which the fresh fruit and jam trade is mainly interested moderate to heavy winter pruning to stimulate new growth is the general practice.

At planting, the trees should be headed back to within 18 inches of the ground. Where branches suitable for forming a framework are present, they should be cut back to a uniform length so as to produce a strong balanced framework for the future tree.

Plate 119.

BROWN TURKEY VARIETY PRUNED AT THE END OF THE FIRST SEASON.

At the end of the first season's growth the secondary arms which will have developed are well shortened back and, where necessary, thinning is practised (see Plate 119). Sucker growth should be entirely removed. Undesirable inside branches arising from the main arms should also be cut out. Long weak limbs that do not show a tendency to branch should be shortened back generally, to the limit of the other growths so that the tree will produce a strong, compact, and symmetrical head. The top should not be allowed to become too dense; on the other hand, it should not be kept too open because of the risk of sun scalding of the main limbs and branches. A similar plan of treatment should be adopted for the next two years (see Plate 120).

The subsequent pruning of the trees should then be directed towards the annual production of new and vigorous wood and the prevention of a dense growth of short weak twigs (see Plates 121 and 122).

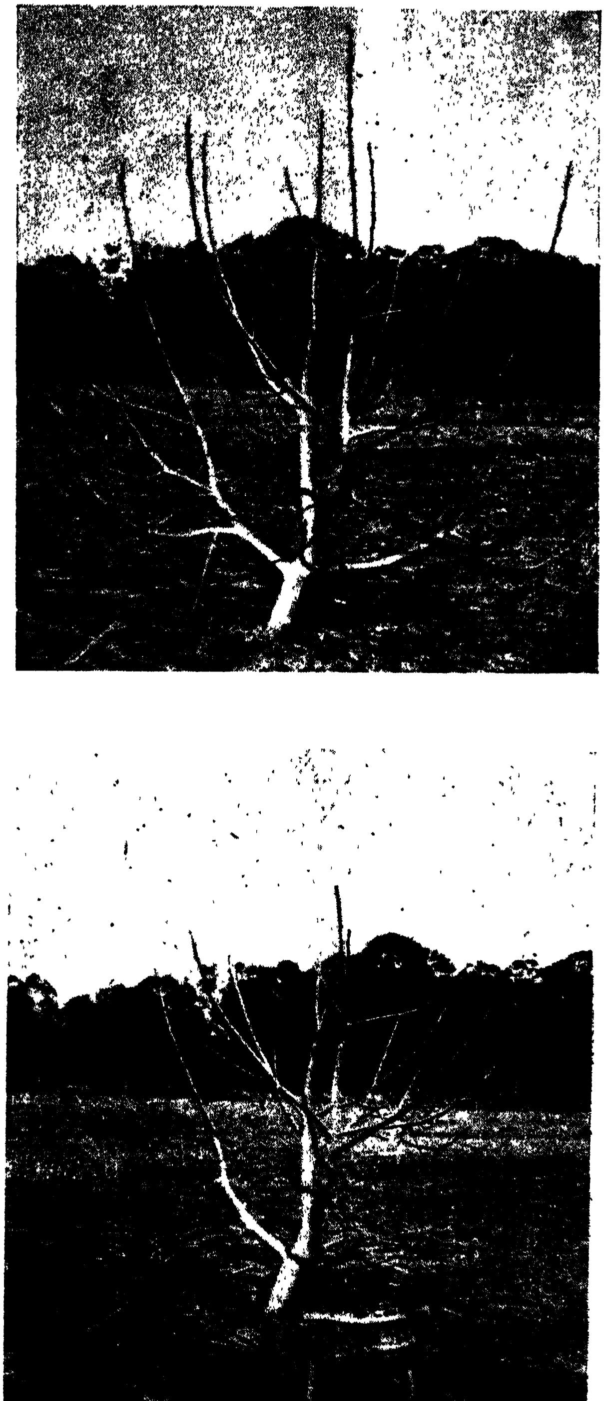
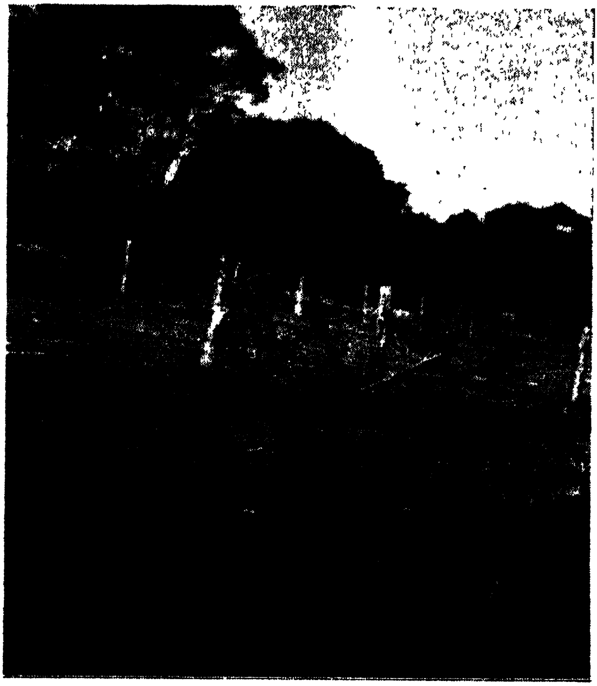


Plate 120.

A TWO-YEAR-OLD BROWN TURKEY FIG TREE BEFORE AND AFTER PRUNING.

Plate 121.
A SEVEN-YEAR-OLD CAPE WHITE FIG TREE AFTER PRUNING.

Plate 122.
A FIFTEEN-YEAR-OLD BROWN TURKEY FIG TREE AFTER PRUNING.



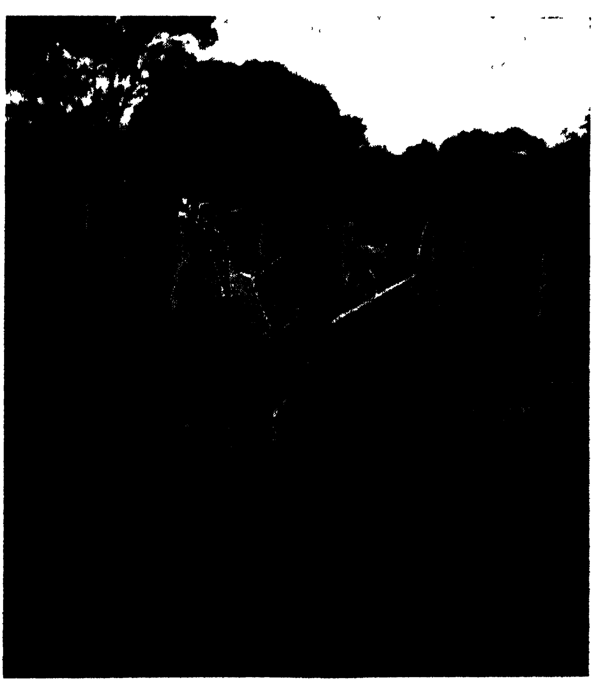


Plate 123.

A POORLY FRAMED BROWN TURKEY FIG TREE BEFORE AND AFTER PRUNING.

In some varieties, such as the Adriatic, this later pruning consists of an occasional thinning out and shortening back of the top in order to stimulate new vigorous growth on the main framework. In the case of Brown Turkey, grown in coastal areas, where the second crop fruits are of paramount importance, a heavy winter pruning should be practised. This variety is remarkably productive under such treatment.

Renovating decadent trees, providing they have a sound framework and a healthy rooting system, may be accomplished by a severe heading back on to secondary arms to within 12 to 18 inches of the primary framework, thus stimulating new growth from which selections for the new top may be made (see Plate 123).

When declining trees are cut back in this manner it should be remembered that the bark is susceptible to sun scald and all exposed limbs must be thickly coated with a suitable whitewash.

CULTIVATION.

The cultivation programme for the fig orchard is similar to that for other deciduous fruit trees. It should be designed to maintain and improve soil fertility and moisture-holding capacity and to suppress weed growth, which would compete with the trees for soil moisture during dry periods.

In the coastal districts light cultivation as often as is necessary to destroy weeds during the dry spring months is desirable. In the absence of bulky organic farmyard manure, maintenance and improvement of soil fertility may be achieved by growing and discing in green manure crops. Here the summer rainfall period may be successfully utilised with such crops as Poona pea and crotalaria planted in December or January for discing in during late March. A winter green crop, such as New Zealand blue lupin, field peas, and skinless barley, mustard, &c., could with advantage follow and be disced or ploughed in during July.

It should be remembered that, though fig trees develop large roots, they also have an extensive fibrous rooting system which is extremely sensitive to injury. These feeding roots do not penetrate the soil very deeply and, therefore, careful shallow cultivation must be aimed at.

FERTILIZING.

In reasonably fertile lands the addition of artificial fertilizer to the soil either before or at the time of planting is unnecessary, but in land that has been previously cropped or which would not be classed as fertile assistance to the growing plants in this way is required. When fertilizer is applied it should be thoroughly incorporated in the soil. It should not be allowed to come into direct contact with the existing roots at the time of planting.

As the trees develop the quantity of fertilizer required for each one will correspondingly increase, and when they are fully grown a regular supply is necessary.

From general observations in the field it would appear that nitrogen is one of the main constituents required to maintain healthy

and vigorous fig trees. Therefore, consideration should be given to fertilizer mixtures high in nitrogen. Mixtures at present available and showing analyses such as 8-12-7·5, 8-12-6, and 8-12-4 would be suitable.

An early spring application of a mixture containing a source of readily available nitrogen should stimulate growth and yields. From 8 to 10 cwt. per acre is a suitable basis for the spring application to mature-bearing trees, to be followed by a second application at the rate of 4 cwt. to the acre when the main crop figs are half grown.

HARVESTING AND MARKETING.

In the coastal areas the harvesting season commences towards the end of December and continues until the end of March. The Cape White is the first one ready to pick and then Genoa, Brown Turkey, Brunswick, and White Adriatic follow on.

The trees are picked over from time to time in order to harvest the fruit in prime condition. It should be picked into shallow containers and placed in suitable boxes for transport to the factory. The boxes at present in use hold approximately a bushel of fruit, weighing about 56 lb.

For the fresh fruit market, figs are packed in a single layer in rectangular cardboard boxes 8 inches long 6 inches wide and 2 inches deep, holding twelve fruits. For transport these are packed in containers holding from twelve to sixteen boxes; a bushel case opened on the side comfortably holds sixteen boxes.

YIELDS.

Figs are usually regarded as coming into profit in their sixth year, though under favourable conditions small crops may be harvested in their fourth season.

The production per tree varies very considerably, depending to a large extent upon the variety. Well-grown, mature Brown Turkey trees producing four to five cases per tree are considered satisfactory, but trees twenty to thirty years old are producing up to eight cases per year.

DISEASES AND PESTS.

In coastal districts the main diseases causing fig growers concern are brown leaf spot and fig rust. Both these diseases affect the leaves, which eventually shrivel and fall. They may be controlled by the application of suitable fungicidal sprays.

The principal pests affecting fig trees are the fig leaf beetle and fig leaf hopper. Both these pests are readily controlled by DDT sprays or dusts. Red scale and soft scale also occur from time to time. These insects, however, can be kept under practical control by the application of white oil sprays.

More detailed information regarding pest and disease control may be obtained on application to the Science Branch, Department of Agriculture and Stock, William street, Brisbane.

Queensland Butter Production, 1947-1948.

E. B. RICE, F. TREACY, and N. McCABE, Division of Dairying.

THE output of Queensland butter factories for the year ended 30th June, 1948, was 104,057,684 lb. Due to the excellent seasonal conditions experienced throughout the year in most dairying districts of the State this figure exceeded that of the previous year by 29,989,663 lb. and as the following table indicates was the highest since 1942-1943.

Year.	Tons.
1938-39	68,919
1939-40	62,408
1940-41	52,268
1941-42	42,712
1942-43	49,782
1943-44	45,275
1944-45	42,413
1945-46	45,197
1946-47	33,304
1947-48	46,454

The Commonwealth Government has continued to pay a subsidy to dairymen to bridge the gap between cost of production and market value. As a result of a survey conducted by the industry the amount of subsidy was increased as from 1st April, 1947 to a figure estimated to return to the supplier the sum of two shillings per pound for choice butter and the Commonwealth Government guaranteed to maintain this

price subject to any fluctuations in the cost of production for a period of five years from that date. The average payout to suppliers in recent years has been:—

Year.	Commercial Butter. Per lb. s. d.
1938-39	1 1·55
1939-40	1 2·02
1940-41	1 1·88
1941-42	1 1·63
1942-43	1 3·9
1943-44	1 6·8
1944-45	1 7·9
1945-46	1 7·9
1946-47	1 8·29
1947-48 (estimated)	2 0

Of the total butter production 86 per cent. was officially examined by Commonwealth and State grading staffs.

Grading results were:—

	Boxes.	Per cent.
Choice grade	814,790	50·99
First grade	703,003	43·99
Second grade	72,711	4·55
Pastry grade	7,502	·47

The following table sets out the grading results in recent years:—

Year.	Grades.			
	Choice.	First.	Second.	Pastry.
	Per cent.	Per cent.	Per cent.	Per cent.
1938–39 Export Only	51·06	38·24	9·97	·73
1939–40 Export Only	49·9	37·4	11·8	·97
1940–41 Export Only	49·26	38·1	11·3	1·34
1941–42	52·51	41·11	5·77	·61
1942–43	54·94	39·94	4·68	·44
1943–44	52·0	43·0	5·0	..
1944–45	45·37	47·4	6·53	·7
1945–46	36·53	55·52	6·87	1·08
1946–47	32·46	59·75	7·08	·71
1947–48	50·99	43·99	4·55	·47

It will be seen that butter quality has shown some improvement over recent years. However, there is still room for considerable improvement. The percentage of butter officially graded as choice is still lower than the figures for the years 1941 to 1944 and far below the record figure of over 60 per cent. choice grade achieved in 1937-1938.

The accompanying tables cover the operations of individual factories for the year. The figures for make and pay are compiled from the monthly returns which each factory is required to furnish to the

Department of Agriculture and Stock under the *Dairy Produce Acts*, and the figures show the total quantity of butter and the quantity of each grade made by each factory. The pay figures show the total quantity of butter and the quantity of each grade for which suppliers have been paid.

There is a natural relationship between the two sets of figures and and an examination of them will show whether the quantity of butter manufactured in each grade can be reconciled with the quantity paid for. While it is not possible to make exactly the same quantity of each grade of butter as is paid for, the discrepancy observed in the figures for some factories, especially when they are compared with the official gradings, suggests that in some instances at least, butter is not being manufactured or paid for in accordance with its true grade.

The official gradings show the result when the factory gradings are checked by the Commonwealth and State graders. Butter is manufactured at the factory into three grades and the figures in the tables indicate the quantity and the percentage of this butter which is true to grade when it is officially graded. These figures indicate whether factories are manufacturing butter true to grade. It must be remembered that in most cases only portion of a factory's manufacture is graded officially, as, except in the case of Brisbane, there is no provision for the official grading of butter for local consumption.

SUMMARY OF PRODUCTION AND GRADINGS.

MANUFACTURE IN LB.

Total.	Choice.	First.	Second.	Pastry.
104,057,684	65,411,637	35,599,002	3,029,042	18,003

PAY IN LB.

104,361,376	67,877,185	33,884,060	2,588,526	11,605

OVER-RUN.

Actual	3,006,129	= 2.97 per cent.
Paid	3,104,008	= 3.07 per cent.

Butter Submitted for Grading.		Grading Result.			
Grade.	No. of Boxes.	Choice.	First.	Second.	Pastry.
Choice	941,030	814,790	125,456	677	107
First	604,655	..	577,547	26,758	350
Second	51,934	..	..	45,276	6,658
Pastry	387	..	..	..	387
Totals	1,598,006	814,790 50·99%	703,003 43·99%	72,711 4·55%	7,502 ·47%

Percentage of Production Graded = 86

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1948.

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Atherton	Make	2,385,998	2,384,162	..	1,836	..	91,500	90,270	48·12
	Pay	2,384,768	2,369,477	..	15,291	..	3·99%	3·93%	..
* Bushy Creek	Make	7,316	7,316	..	..	..	..	..	..
	Pay	..	..	..	..	..	..	..	..
Caboolture	Make	2,047,087	1,845,355	201,732	..	..	69,949	78,055	73·17
	Pay	2,055,119	1,912,160	141,208	1,751	..	3·54%	3·95%	..
Eumundi	Make	2,119,948	1,939,418	177,618	2,912	..	79,333	80,146	91·76
	Pay	2,120,761	1,976,955	141,452	2,354	..	3·89%	3·93%	..
Pomona	Make	1,692,795	1,604,917	87,878	..	..	47,925	47,702	96·15
	Pay	1,692,572	1,649,071	42,860	641	..	2·91%	2·9%	..
Chinchilla	Make	1,853,007	1,023,703	615,552	203,672	10,080	25,714	26,789	95·94
	Pay	1,854,082	1,078,141	609,799	159,245	6,897	1·41%	1·47%	..
Daintree	Make	89,042	89,042	..	..	..	2,354	2,354	nil
	Pay	89,042	89,042	..	..	..	2·72%	2·72%	..
† Dayboro	Make	134,652	..	134,652	..	..	..	..	20·00
	Pay	347,590	314,402	33,188	..	..	..	..	..
Toowoomba	Make	2,634,520	1,756,832	733,936	143,752	..	89,939	89,959	60·75
	Pay	2,634,540	1,744,244	747,289	143,007	..	3·53%	3·53%	..
Clifton	Make	1,101,408	839,776	256,928	4,704	..	30,575	30,620	95·58
	Pay	1,101,453	838,316	259,036	4,101	..	2·86%	2·86%	..

*Ceased operations 31st December, 1947. Complete pay figures not available.

† A large proportion of this factory's cream was resold as cream.

OFFICAL GRADINGS IN BOXES.

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Atherton ..	20,125	19,420 96·5%	705 3·5%	..	..	31	..	31 100%	..	347	347 100%	..	..
Caboolture ..	23,149	19,040 82·25%	3,989 17·23%	25 ·11%	95 ·41%	3,461	3,003 86·77%	458 13·23%	..	136	136 100%	..	..
Eumundi ..	31,545	17,752 56·28%	13,674 43·35%	119 ·37%	..	3,051	1,435 47·03 %	1,616 52·97%	..	139	139 100%	..	..
Pomona ..	27,490	21,882 79·6%	5,608 20·4%	..	..	1,539	858 55·75%	663 43·08%	18 1·17%	35	35 100%	..	..
Chinchilla ..	16,969	12,954 76·34%	3,986 23·49%	29 ·17%	..	10,962	10,278 93·76%	684 6·24%	..	3,637	2,904 79·85%	733 20·15%	178
Daintree ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dayboro ..	481	..	450 93·56%	31 6·44%	..	..	..	..	..	..	..	..	..
Toowoomba ..	14,761	14,132 95·74%	629 4·26%	..	..	13,105	12,776 97·49%	329 2·51%	..	714	546 76·47%	168 23·53%	..
Clifton	14,105	14,044 99·57%	61 ·43%	..	..	4,609	4,588 99·54%	21 ·46%	..	84	19 22·62%	65 77·38%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30th JUNE, 1948—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Crow's Nest	Make	1,549,296	868,728	659,512	21,056	..	45,853	45,802	100
	Pay	1,549,245	868,554	660,747	19,944	..	3·05%	3·05%	..
Dalby	Make	2,829,118	1,023,566	1,769,264	36,288	..	83,874	83,881	93·66
	Pay	2,829,125	1,023,733	1,775,746	29,646	..	3·06%	3·06%	..
Goombungee	Make	1,539,160	471,856	1,041,992	25,312	..	40,401	40,436	100
	Pay	1,539,195	472,109	1,042,252	24,834	..	2·70%	2·70%	..
Jandowae	Make	2,140,153	815,582	1,178,691	145,880	..	61,963	62,003	99·32
	Pay	2,140,193	815,807	1,178,504	145,882	..	2·98%	2·98%	..
Miles	Make	908,236	85,192	662,144	160,900	..	25,630	25,620	89·08
	Pay	908,226	85,157	662,862	160,207	..	2·9%	2·9%	..
Esk	Make	2,296,585	1,148,707	1,120,504	27,374	..	43,302	43,291	95·40
	Pay	2,296,574	1,141,947	1,134,695	19,932	..	1·92%	1·92%	..
Evelyn Tableland ..	Make	519,340	519,340	..	..	..	19,946	19,957	52·16
	Pay	519,351	495,377	21,988	1,986	..	3·99%	4·00%	..
Gayndah	Make	1,574,968	1,001,416	524,160	49,392	..	61,085	60,650	96·35
	Pay	1,574,533	1,000,785	530,691	43,057	..	4·03%	4·01%	..
Killarney	Make	1,522,074	941,142	539,392	41,540	..	32,154	32,105	81·61
	Pay	1,522,025	868,105	608,642	45,278	..	2·16%	2·15%	..
Logan and Albert ..	Make	3,151,061	2,647,453	503,608	..	..	112,923	112,950	96·66
	Pay	3,151,088	2,707,272	443,047	769	..	3·72%	3·72%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Crow's Nest ..	16,269	15,014 92·29%	1,255 7·71%	..	..	11,972	11,727 97·95%	245 2·05%	..	376	376 100%	..	..
Dalby	14,924	14,695 98·47%	229 1·53%	..	..	31,744	31,637 99·66%	107 ·34%	..	648	580 89·51%	68 10·49%	..
Goombungee ..	8,181	7,444 90·99%	737 9·01%	..	..	19,038	19,014 99·87%	24 ·13%	..	452	452 100%	..	..
Jandowae ..	14,132	13,881 98·22%	251 1·78%	..	..	21,227	20,438 96·28%	789 3·78%	..	2,600	2,301 88·5%	299 11·5%	..
Miles	188	188 100%	..	..	..	11,119	9,043 81·33%	2,076 18·67%	..	2,732	1,957 71·63%	775 28·37%	..
Esk	18,647	15,469 82·96%	3,178 17·04%	..	..	19,988	19,276 96·44%	712 3·56%	..	489	355 72·6%	134 27·4%	..
Evelyn Tableland	2,959	2,674 90·37%	285 9·63%	..	..	1,648	1,648 100%	..	..	193	193 100%	..	37
Gayndah ..	16,856	14,106 83·69%	2,750 16·31%	..	..	9,376	7,776 82·94%	1,600 17·06%	..	866	654 75·52%	212 24·48%	..
Killarney ..	10,084	9,016 89·41%	1,068 10·59%	..	..	11,199	11,012 98·33%	187 1·67%	..	899	873 97·11%	26 2·89%	..
Logan and Albert	45,397	37,363 82·31%	7,969 17·55%	65 ·14%	..	8,994	7,670 85·28%	1,324 14·72%	..	..	..	..	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1948—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Maleny	Make	2,390,453	2,281,533	108,920	..	..	66,260	65,334	94·47
	Pay	2,389,527	2,300,448	88,004	1,075	..	2·85%	2·81%	..
Maryborough	Make	918,580	519,449	364,019	35,112	..	36,300	38,288	42·38
	Pay	920,568	574,362	316,112	30,094	..	4·11%	4·34%	..
Biggenden	Make	1,863,179	1,104,491	758,688	..	..	82,350	84,173	93·15
	Pay	1,865,002	1,189,939	675,063	..	..	4·62%	4·73%	..
Kingaroy	Make	3,981,663	3,634,575	252,448	94,640	..	156,801	170,255	67·52
	Pay	3,995,117	3,682,338	232,353	80,426	..	4·10%	4·45%	..
Mundubbera	Make	2,537,396	2,198,652	256,928	81,816	..	73,646	74,472	97·16
	Pay	2,538,222	2,246,493	233,148	58,581	..	2·99%	3·02%	..
Wondai	Make	2,583,403	1,768,494	771,400	43,509	..	121,345	123,415	95·98
	Pay	2,585,473	1,858,159	694,191	33,123	..	4·93%	5·01%	..
Millaa Millaa	Make	902,618	893,770	..	8,848	..	25,591	27,349	40·33
	Pay	904,376	897,302	..	7,074	..	2·92%	3·12%	..
Milmerran	Make	1,392,582	522,566	742,112	127,904	..	32,328	37,956	98·59
	Pay	1,398,210	533,467	768,314	96,429	..	2·38%	2·79%	..
Nanango	Make	2,806,881	1,711,409	1,041,880	53,592	..	83,874	84,425	96·38
	Pay	2,807,432	1,871,400	904,026	32,006	..	3·08%	3·10%	..
Oakey	Make	3,850,200	2,875,632	749,112	225,456	..	129,655	131,368	94·80
	Pay	3,851,913	2,922,631	765,839	163,443	..	3·49%	3·53%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result. Choice.	First.	Second.	Pastry.	Boxes Submitted As First Quality.	Official Grading Result. First.	Second.	Pastry.	Boxes Submitted As Second Quality.	Official Grading Result. Second.	Pastry.	Boxes Submitted as Pastry Quality.
Maleny ..	38,311	34,967 91·27%	3,344 8·73%	..	..	2,014	1,866 92·65%	148 7·35%	..	..	..	..	..
Maryborough ..	3,071	438 14·26%	2,495 81·24%	126 4·11%	12 ·39%	3,336	2,845 85·28%	491 14·72%	..	522	85 16·28%	437 83·72%	22
Biggenden ..	17,388	13,168 75·73%	4,220 24·27%	..	..	13,603	12,802 94·11%	725 5·33%	76 ·56%	..	..	..	..
Kingaroy ..	41,838	40,583 97·0%	1,255 3·0%	..	..	4,508	4,380 97·16%	128 2·84%	..	1,664	1,496 89·9%	168 10·1%	..
Mundubbera ..	37,982	28,440 74·88%	9,522 25·07%	20 ·05%	..	4,603	2,517 54·68%	2,086 45·32%	..	1,439	1,031 71·65%	408 28·35%	..
Wondai ..	29,783	27,380 91·93%	2,403 8·07%	..	..	13,796	13,473 97·66%	323 2·34%	..	670	583 87·01%	87 12·99%	30
Millaa Millaa ..	785	785 100%	..	..	..	5,557	5,557 100%	..	..	158	76 48·1%	82 51·9%	..
Milmerran ..	8,372	7,191 85·89%	1,181 14·11%	..	..	13,308	12,979 97·53%	329 2·47%	..	2,247	1,900 84·56%	347 15·44%	21
Nanango ..	28,568	24,511 85·8%	4,056 14·2%	1	..	18,712	18,023 96·32%	689 3·68%	..	1,028	926 90·08%	102 9·92%	..
Oakey	47,974	45,719 95·3%	2,255 4·7%	..	..	13,178	12,866 97·63%	294 2·23%	18 ·14%	4,026	3,968 98·56%	58 1·44%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAD ENDED 30TH JUNE, 1948—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Bundaberg	Make	1,984,242	693,978	1,290,264	..	..	53,771	55,283	72·07
	Pay	1,985,754	702,250	1,283,234	270	..	2·79%	2·86%	..
Gladstone	Make	1,422,483	316,045	1,103,629	2,809	..	35,559	36,541	86·66
	Pay	1,423,465	358,425	1,062,142	2,898	..	2·56%	2·63%	..
Mackay	Make	630,770	179,135	444,048	..	7,587	10,732	13,045	nil
	Pay	633,083	185,419	440,496	2,950	4,218	1·73%	2·10%	..
Monto	Make	3,648,627	1,719,075	1,928,584	968	..	67,734	74·635	98·87
	Pay	3,655,528	1,856,778	1,797,158	1,592	..	1·89%	2·08%	..
Rockhampton	Make	1,582,755	522,142	1,025,340	35,273	..	16,044	23,513	22·87
	Pay	1,590,224	532,780	1,024,133	33,311	..	1·02%	1·50%	..
Wowan	Make	2,252,903	1,111,680	1,134,947	6,276	..	24,160	54,363	91·06
	Pay	2,283,106	1,151,290	1,125,883	5,933	..	1·08%	2·44%	..
Biloela	Make	3,797,313	2,035,909	1,748,468	12,936	..	76,047	83,077	86·89
	Pay	3,804,343	2,133,842	1,660,183	10,318	..	2·04%	2·23%	..
Q.A.H.S. and College ..	Make	45,682	45,682	..	..	..	762	748	nil
	Pay	45,668	44,708	857	103	..	1·70%	1·67%	..
Boonah	Make	3,708,532	1,211,648	2,172,817	324,067	..	133,776	133,833	95·49
	Pay	3,708,589	1,346,772	2,114,700	247,117	..	3·74%	3·74%	..
Booval	Make	3,074,298	1,305,435	1,443,736	324,791	336	83,400	87,275	73·26
	Pay	3,078,173	1,124,492	1,676,003	277,678	..	2·79%	2·92%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Bundaberg ..	4,282	3,417 79·8%	865 20·2%	..	..	21,254	21,210 99·79%	44 ·21%	..	..	..	..	..
Gladstone ..	2,842	2,714 95·5%	128 4·5%	..	..	19,172	19,026 99·24%	146 ·76%	..	..	..	..	..
Mackay ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Monto	29,392	27,832 94·69%	1,523 5·18%	37 ·13%	..	34,989	34,186 97·7%	803 2·3%	..	34	34 100%	..	..
Rockhampton	..	..	..	..	..	6,092	5,919 97·16%	173 2·84%	..	373	157 42·09%	216 57·91%	..
Wowan ..	17,732	17,246 97·26%	486 2·74%	..	..	18,858	18,339 97·25%	519 2·75%	..	43	22 51·16%	21 48·84%	..
Biloela	29,929	29,150 97·40%	779 2·60%	..	..	28,753	28,136 97·85%	379 1·32%	238 ·83%	240	195 81·25%	45 18·75%	
Q.A.H.S. and College	..	..	..	..	..	..	..	..	..	..	..	..	..
Boonah ..	19,574	13,300 67·95%	6,274 32·05%	..	..	37,933	36,999 97·54%	934 2·46%	..	5,733	5,642 98·41%	91 1·59%	..
Booval	8,950	7,539 84·23%	1,411 15·77%	..	..	25,733	24,946 96·94%	787 3·06%	..	5,535	5,192 93·8%	343 6·2%	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1948—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Grantham	Make	2,063,589	584,283	1,417,978	61,328	..	58,214	58,136	95·16
	Pay	2,063,511	601,582	1,408,038	53,891	..	2·90%	2·90%	..
Laidley	Make	1,789,971	869,146	873,942	46,883	..	55,009	54,930	95·09
	Pay	1,789,892	904,509	844,874	40,509	..	3·17%	3·17%	..
Lowood	Make	806,506	189,404	580,390	36,712	..	19,513	19,460	93·81
	Pay	806,453	194,524	581,619	30,310	..	2·48%	2·47%	..
Roma	Make	871,794	..	601,146	270,648	..	24,788	24,788	54·63
	Pay	871,794	179,900	438,025	253,360	509	3·32%	3·32%	..
Murgon	Make	2,637,985	1,604,393	1,026,816	6,776	..	78,987	78,672	84·14
	Pay	2,637,670	1,980,892	654,073	2,705	..	3·09%	3·07%	..
Proston	Make	1,389,823	840,911	510,832	38,080	..	52,965	53,039	96·81
	Pay	1,389,897	902,557	455,386	31,954	..	3·96%	3·97%	..
Kingston	Make	3,924,536	2,187,696	1,555,568	181,272	..	115,622	115,778	99·59
	Pay	3,924,692	2,322,152	1,438,943	163,597	..	3·04%	3·04%	..
Woodford	Make	1,452,251	863,783	587,476	992	..	37,176	36,140	96·8
	Pay	1,451,215	1,238,632	212,583	..	..	2·63%	2·55%	..
Allora	Make	1,337,102	1,328,699	8,291	112	..	32,723	30,992	86·2
	Pay	1,335,371	1,307,792	27,273	306	..	2·51%	2·38%	..
Inglewood	Make	473,088	244,664	213,136	15,288	..	16,361	16,021	78·08
	Pay	472,748	197,961	260,525	14,262	..	3·58%	3·51%	..

OFFICIAL GRADINGS IN BOXES—*continued.*

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Grantham ..	8,428	5,729 67·98%	2,699 32·02%	..	..	25,499	24,483 96·02%	1,016 3·98%	..	1,140	884 77·54%	256 22·46%	..
Laidley ..	13,939	10,777 77·32%	3,132 22·47%	30 ·21%	..	15,624	15,235 97·51%	389 2·49%	..	831	723 87·00%	108 13·00%	..
Lowood ..	2,514	2,060 81·94%	454 18·06%	..	..	10,356	9,925 95·84%	431 4·16%	..	640	505 78·91%	135 21·09%	..
Roma	..	..	..	..	..	3,811	3,677 96·48%	134 3·52%	..	4,694	4,365 92·99%	329 7·01%	..
Murgon ..	21,159	15,688 74·14%	5,471 25·86%	..	..	18,355	17,992 98·02%	363 1·98%	..	121	95 78·51%	26 21·49%	..
Proston ..	14,361	11,515 80·18%	2,846 19·82%	..	..	8,866	8,515 96·04%	351 3·96%	..	800	702 87·75%	98 12·25%	..
Kingston ..	39,441	33,487 84·9%	5,954 15·1%	..	..	27,134	27,030 99·62%	104 ·38%	..	3,217	2,960 92·01%	257 7·99%	..
Woodford ..	14,665	9,429 64·3%	5,152 35·13%	84 ·57%	..	10,421	9,441 90·6%	980 9·4%	..	17	17 100%	..	..
Allora	20,435	19,764 96·72%	615 3·01%	56 ·27%	..	143	139 97·2%	4 2·8%	..	3	3 100%	..	..
Inglewood ..	2,499	2,025 81·03%	474 18·97%	..	..	3,824	3,776 98·74%	48 1·26%	..	272	262 96·31%	10 3·69%	1

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED 30TH JUNE, 1948—*continued.*

Factory.		Manufacture and Payments in Lb.					Over-run.		Make Graded.
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.
Mill Hill	Make	1,359,303	1,349,951	2,576	6,776	..	37,720	40,637	55·11
	Pay	1,362,220	1,209,522	145,720	6,978	..	2·85%	3·07%	..
Texas	Make	161,055	120.827	27,328	12,900	..	6,517	7,231	24·2
	Pay	161,769	72,809	73,267	15,693	..	4·22%	46·8%	..
Cooroy	Make	1,413,528	1,250,904	146,720	15,904	..	45,604	45,652	93·64
	Pay	1,413,576	1,342,347	69,370	1,859	..	3·33%	3·33%	..
Gympie	Make	6,906,829	6,311,473	502,600	92,756	..	150,137	150,601	95·06
	Pay	6,907,293	6,458,037	378,519	70,737	..	2·22%	2·22%	..

OFFICIAL GRADINGS IN BOXES—*continued*.

Factory.	Boxes Submitted As Choice.	Official Grading Result.				Boxes Submitted As First Quality.	Official Grading Result.			Boxes Submitted As Second Quality.	Official Grading Result.		Boxes Submitted as Pastry Quality.
		Choice.	First.	Second.	Pastry.		First.	Second.	Pastry.		Second.	Pastry.	
Mill Hill ..	13,210	12,718 96·28%	492 3·72%	..	..	46	46 100%	..	..	121	68 56·2%	53 43·8%	..
Texas	..	..	..	..	..	466	280 60·09%	186 39·91%	..	230	207 90%	23 10%	..
Cooroy	20,731	19,465 93·89%	1,212 5·85%	54 ·26%	..	2,621	1,953 74·51%	668 25·49%	..	284	244 85·92%	40 14·08%	..
Gympie ..	106,613	98,679 92·56%	7,934 7·44%	..	..	9,027	6,807 75·41%	2,220 24·59%	..	1,505	1,067 70·9%	438 29·1%	98

Fat Lamb Production in Queensland.

G. R. MOULE, Officer in Charge, Sheep and Wool Branch.

INTRODUCTION.

WHILE there is a demand for Australian merino wool from many countries, Australian lamb and mutton sold overseas have gone mainly to the English market. Total exports of lamb amount to almost 50,000 tons annually and in 1946-47 returned £A3,632,000.

The lamb industry is centred mainly in Victoria, which contributes over half of Australia's total exports, though New South Wales and South Australia are also heavy producers. Queensland has not a well-developed export trade in lamb, but the industry is capable of considerable expansion.

It is well known Australians are heavy meat eaters. They consume approximately $1\frac{3}{4}$ lb. of beef, $1\frac{1}{2}$ lb. of mutton, and $\frac{1}{2}$ lb. of lamb a week. This means that there is an important local market for lamb and this is particularly true of Queensland.

The whole of the world faces a desperate food shortage and, while any development in the export lamb trade may come comparatively slowly, the local trade is capable of immediate expansion. It is well known that food production in Australia will have to be increased very considerably to maintain an exportable surplus of meat, unless present rates of consumption decrease. This means that more lamb is needed to meet the requirements of the home trade.

PRESENT POSITION OF THE LAMB INDUSTRY.

Production and Expansion Possibilities.

In all States the number of lambs produced per year has been increasing and Australian slaughterings reached a peak of 11,931,260 in 1942-43. In Queensland, annual lamb production has varied between 49,768 and 150,349 carcases in as short a period as four years, but since 1938-39 has not been below 100,000. During the war years there was a steady increase and in 1945-46 the number of lambs slaughtered was 139,000. In 1943-44 the total slaughtering of lambs in Queensland amounted to 108,825 and of these only 425 carcases were exported.

When the Australian Meat Board was formed in 1936 a general survey was made of the Australian lamb industry by Mr. J. M. Coleman of the New South Wales Department of Agriculture. He stressed that

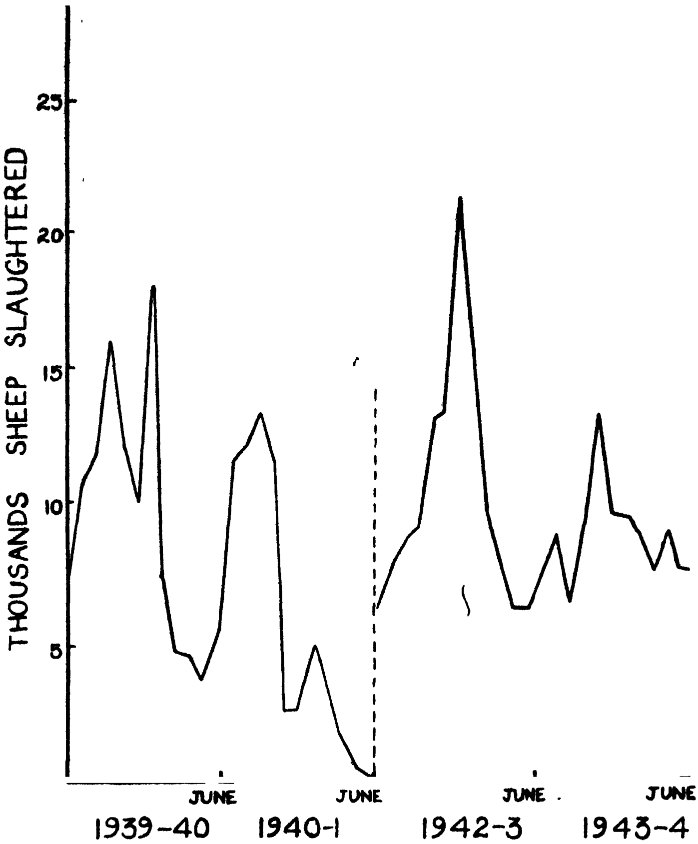


Plate 124.

LAMBS SLAUGHTERED PER MONTH FROM JULY, 1939, TO JUNE, 1944.

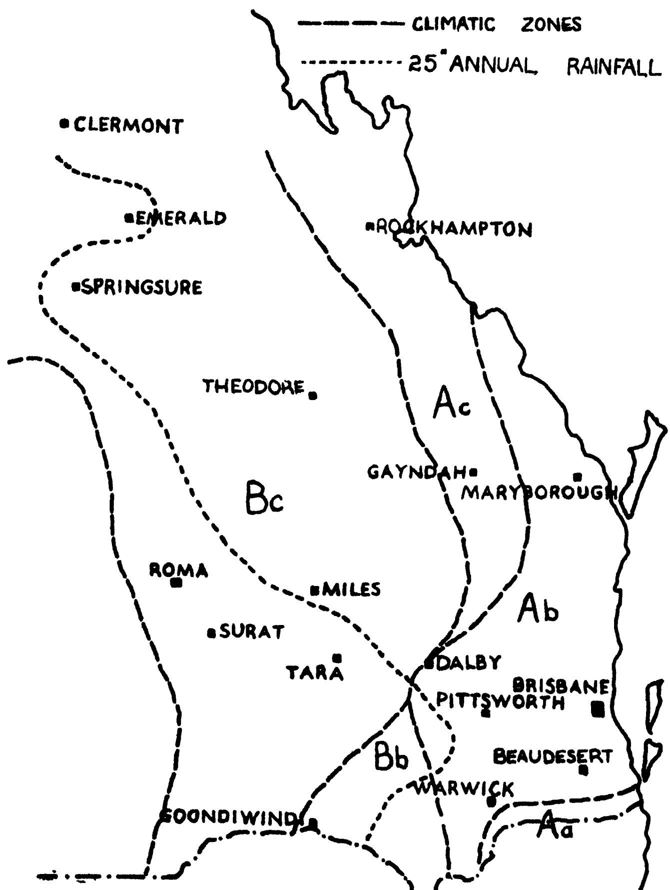
uniformity of type must be aimed at and that, in view of the fact that the United Kingdom takes about 98 per cent. of Australian lamb exported, a "Downs" type of carcase should be the standard. With a view to implementing these recommendations, and at the same time to stress to the producer the type of carcase required, the Australian Meat Board inaugurated a series of fat lamb competitions, which were conducted at Smithfield. The competitions were suspended at the outbreak of war, but it is to Queensland's credit that in the last one an entry from this State obtained second place. However, Queensland is greatly handicapped on the overseas market and our product suffers on the home market because of seasonal fluctuations in quality and quantity, which are evident from Table 1, showing gradings of Queensland export lamb from 1936-37 to 1943-44.

It should be pointed out that the sudden decrease in 1941-42 in the number of carcases exported from Queensland was largely due to the war. The American troops in Queensland consumed a considerable amount of lamb and the rationing scale was designed to increase mutton and lamb consumption and to decrease that of beef.

TABLE 1.

GRADINGS OF EXPORT CARCASES.

Year.	Carcases Exported.	1st Grade.	2nd Grade.	3rd Grade.
		Per cent.	Per cent.	Per cent.
1936–7 ..	30,250	22·1	53·0	24·8
1937–8 ..	7,848	19·8	62·4	17·8
1938–9 ..	15,789	31·9	51·8	16·3
1939–40 ..	24,362	32·4	53·6	14·0
1940–1 ..	13,614	34·0	53·1	12·9
1941–2 ..	3,238	51·1	42·4	6·5
1942–3 ..	5,887	32·6	50·5	16·8
1943–4 ..	425	25·2	50·1	24·7



Aa = 6 months summer rainfall + 6 months winter rainfall.
Ab = 6 months summer rainfall + 4 months winter rainfall.
Ac = 6 months summer rainfall + 2 months winter rainfall.
Bb = 4 months summer rainfall + 4 months winter rainfall.
Bc = 4 months summer rainfall + 2 months winter rainfall.

Plate 125.

SIXTY-SIX PER CENT. RELIABILITY OF RAINFALL.

Practically all the lamb produced in Queensland comes from the Darling Downs, though recently there has been a slight tendency for the industry to extend to the subcoastal areas. The seasonal nature of lamb production in Queensland is seen from the graph (Plate 124) showing lambs slaughtered each month between July, 1939, and June, 1944. The rise commencing in the winter months and extending to a summer peak is a characteristic of each year except 1940-41, when slaughterings reached almost 14,000 in September and fell to just over 5,000 in February.

A climatological survey of Queensland has indicated that lamb production can be extended. As it is largely dependent upon the plane of nutrition which, in turn is governed mainly by climatic conditions, the occurrence of effective rain (that is, rainfall heavy enough to stimulate plant growth) has been studied. Plate 125 shows the percentage reliability of "effective" rainfall in four summer and two winter months in any one year in the more favoured districts. It is clear that only a small part of Queensland enjoys rainfall with appropriate distribution to allow the type of agriculture which would ensure a sufficiently even plane of nutrition in the majority of years for the fattening of lambs. These areas include Warwick, Pittsworth, and Gayndah, as well as the Lockyer Valley and part of the Burnett, and the Atherton Tablelands. Naturally economic factors will influence the extent to which the lamb industry will extend into these latter areas.

The marginal country, in which the seasonal conditions are not sufficiently assured to allow fat lamb production to be established as a permanent industry, extends out as far as Goondiwindi, Surat, and Yuleba, and also includes Capella and Clermont. These areas are the logical ones in which to produce crossbred sheep which can be fattened for mutton or first-cross lamb, should the season be favourable for the growth of crops, or turned off as ewes suitable as fat lamb mothers in less favourable years.

Markets for Queensland Lamb.

Although there is a ready market in the United Kingdom for Australian lamb the figures in Table 1 show that Queensland has only been able to provide a small exportable surplus, as the demands of the local market have absorbed most of the lambs produced. It is true that Queenslanders are becoming more "lamb conscious," and meat distributors in Brisbane fear that, unless production is greatly increased, the supply of sucker lamb will not be sufficient to meet the demand. At the same time, towns such as Bundaberg, Maryborough, Gympie, Rockhampton, Mackay, Townsville, and Cairns are not well supplied with lamb, and accordingly there is considerable scope for increasing production to meet local demands.

The Australian average annual consumption of lamb and mutton per head has risen from about 62·5 lb. in the 5-year period 1921-22 to 1925-26 to almost 100 lb., and of this total over one-quarter is lamb.

Market Requirements.

Because the man who eats the "chop" dictates the market requirements it is difficult to describe the ideal carcase in exact terms. Men who undertake heavy manual work like more fat with their meat, and the chop which would be considered palatable by a coal miner probably would not be relished by an office worker.

Plate 126.

An Ideal Carcase Produced by Good Breeding and Good Feeding.

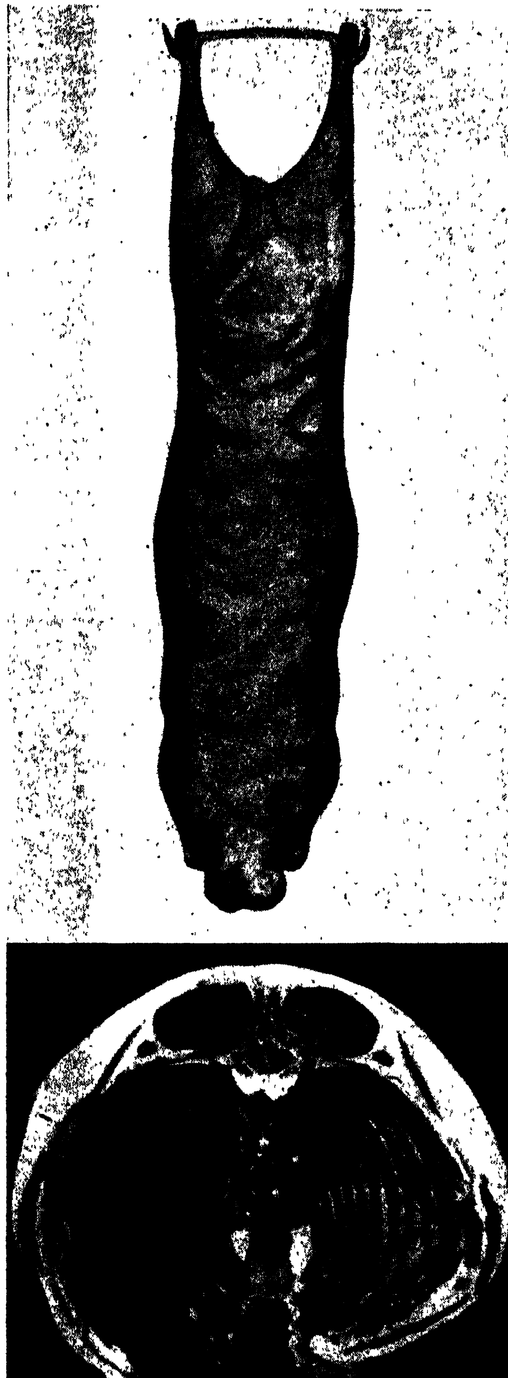


Plate 127.

A Poor Carcase with Long, Badly Covered Legs, Slack Loins, and Uneven Distribution of Fat, Produced by Bad Breeding and Bad Feeding.

The trend towards smaller families has also influenced the type of lamb required. Smaller, blockier joints are now popular, as these meet the requirements of the average family and there is less wastage on cooking.

Differences in individual taste demand different types of carcases for the local market as well as for the export trade. Nevertheless, the carcase should be compact, and at the same time the hindquarters, from which the most expensive cuts of meat come, should be well developed. This means that the leg bones should be short but well covered with muscle, giving a nicely rounded leg of lamb. When the carcase is "on the hooks" the space between the hind limbs should be "U"-shaped rather than "V"-shaped; that is, the twist should be well filled. The carcase should be wide between the stifles, and the measurement from stifle to stifle across the butt of the tail should be large. The loins should be well covered and full and the distance from the base of the tail to the base of the neck should be long, but the neck short. The shoulder should be well covered but not massive. There should be no bruises on the carcase, and the thin muscles on the outside should be a soft, rosy pink to give the impression of "bloom." This is also indicated by a bright colour of the open shank joints. There should be a suitable blend of muscle and fat, and this is especially important in the loin chops. The "eye muscle" should be both deep and broad, with an even covering of $\frac{1}{8}$ inch to $\frac{1}{4}$ inch of fat at the level of the first chop. The fat should extend well down over the hind legs, which should be evenly but not heavily covered. Plate 126 shows the ideal carcase, and for purpose of comparison an undesirable carcase is shown in Plate 127.

At a conference arranged in 1948 by the Australian Meat Board and attended by producers from all States support was given to the adoption of a uniform system of grading of Australian lamb carcases. The schedule was drawn up originally in Victoria and is based on overseas weight/quality requirements.

The weight classes suggested for lambs were up to 28 lb., from 29 to 36 lb., 37 to 42 lb., 43 to 50 lb., and from 50 to 56 lb.

On a quality basis the lambs were graded as "Downs," first, second, or third "Lamb," and "Summer Lamb."

Carcases which show the characteristic squareness of frame, depth of fleshing, shortness of bone, well-filled twist, and good coverage of the loins are graded as "Downs."

Generally speaking, carcases weighing from 29 to 42 lb. are the most saleable because of their small joints. In the lower (third) grade lambs a special weight classification of 20 to 28 lb. is made. Generally speaking the carcases which go into this class have "Merino" legs, they lack a covering of fat, are slack in the loin, and have a blue tinge on the shoulder.

The more "rangy" carcases fall into the 43 to 49 and 50 to 56 lb. classes, and many are unattractive. The joints are heavy, the legs and shoulders blue, and the loin slack. Neither of these classes is in demand on the home or export market because of the large joints.

"Summer" lambs are inclined to be older, and accordingly may be out of shape because of the spread of the pelvis and of the midribs. They have a barky appearance, but because they usually come in late in the Queensland season when the home market is not particularly well supplied, they may bring unexpectedly high prices.

Economic Aspects of Lamb Production.

Fat lamb production is a specialised form of sheep husbandry in which both meat and wool are produced. This gives the lamb-raiser two sources of income from his sheep. In most years that derived from meat is more important than that derived from wool, but this depends upon the relative prices of meat and wool.

Merino and comeback wools have commanded exceptionally high prices since the end of the war. Coarse crossbred wool, however, has not experienced a proportional rise. By comparison with wool overseas meat prices have not risen very much. On the other hand lambs sold on the local market have brought high prices, almost irrespective of conformation.

Under these circumstances the most profitable ewes to run may be Merinos. They are easily obtained and the income earned by their wool more than compensates for the comparatively slow growth and spare fleshing of their offspring. This is particularly true at times when there is only slight differentiation in lamb prices on a quality basis.

At a time when markets are less buoyant the double source of income contributed by sheep used for fat lamb production is an important consideration. The difference in the return from the wool of Merinos and crossbred ewes is not so great, but on a discriminating market the difference in price per lb. between lambs from Merino and crossbred ewes is very apparent. In addition, the lambs from crossbred ewes are more profitable because of more rapid growth rate, which gives a quicker return. Finally, old crossbred ewes have a better carcase value than worn-out Merinos.

Obviously, the producer must consider which method of husbandry will give the greater return. At the same time the well-informed sheep-raiser will vary his methods to meet changing market requirements.

It is difficult to arrive at an accurate figure for the cost of producing lambs. Even if an average figure could be given it probably would not be applicable to many individual cases because there are so many variations in farming practices.

Because of its dependence on agriculture, lamb production in Queensland is more expensive than in southern States. It is the considered opinion of some of the most successful lamb producers on the Darling Downs that about 1,000 acres is the ideal size of a farm for lamb raising. It is preferable to have about 400 acres under cultivation and the remaining 600 acres suitable for grazing purposes. With the usual farm implements and improvements, such a property would represent a fairly high capital investment. At the same time it would probably carry 1,500–2,000 ewes besides a few cattle and the farmer would be able to produce some grain from crops which had been allowed to mature after one or two grazings.

(TO BE CONTINUED.)

Rearing Dairy Calves.

R. D. CHESTER, Officer in Charge, Cattle Husbandry Branch.

EACH year there is a wastage of approximately 20 per cent. of milking cows from the average dairy herd. These cows must be replaced by heifers raised from within the herd or purchased as springers.

On the majority of farms, it is preferable to rear calves for replacement purposes rather than to purchase them from outside sources. The status of health and the production potential of the purchased springer must always be largely unknown. Those of the home-grown heifer are to a greater extent under the control of the farmer.

The aim is to rear only healthy calves capable of developing into high-producing milkers. When possible, the calves should be from cows with production records above the average for the herd. They should be normal and vigorous at birth and sired by a bull of good conformation and of proven worth as a sire of high-producing females. They should be kept in clean, sanitary pens and paddocks; and, finally, they must be raised on well-balanced rations containing adequate food for normal growth and development.

The health and the development of the calf in the first three weeks after birth have a profound effect on its future well-being. During this early period of life, the calf is particularly susceptible to infection and the utmost care is necessary to ensure normal healthy growth immediately after birth. An animal which sickens with scours or pneumonia during the first month of life will not thrive and subsequently will remain stunted and backward even though the original infection no longer operates. On the other hand, the animal which grows normally for a few weeks will seldom prove difficult to rear later in life.

In order that only the best calves are reared to replace culled cows, it is necessary that the farmer know something of the individual production of various cows within his herd. To obtain this knowledge, he must test the cows for production. Having classed his cows, he is then in a position to know just which heifer calves are most likely to be worth keeping. As far as possible, calves should be kept only from cows with production above the herd average.

FEEDING REQUIREMENTS.

Having selected calves from these high-producing cows, it is necessary to raise the animals in such a way that they have the opportunity to develop their frame, so that when mature they will have the capacity to produce. The growing animal should be maintained in strong active condition. Underfeeding results in a small "weedy" heifer unable to consume enough feed to produce more than a few pints of milk. Overfeeding results in a gross over-developed heifer tending rather to beef production and coarseness than to the production of milk.

To ensure that calves thrive and grow normally, the animals' requirements of protein, energy, minerals and vitamins must be met fully.

Protein Needs.

Initially, the calf requires a high-protein diet. This can be reduced gradually as the animal matures. Thus, in calf starters it is wise to have 20 per cent. crude protein. This can be reduced to 16 per cent. by the time the calf is 6 to 8 weeks old, and after four months the protein in the ration may be further reduced.

While the calf is still young, it is necessary to supply some protein of animal origin. Calves which are to receive no milk after 8 or 10 weeks of age require a meal mixture which contains an animal protein, such as dried skim milk, dried butter-milk, blood meal or meatmeal. Only small quantities of these meals are necessary to produce satisfactory results.

After four months of age, lucerne hay alone is sufficient as a source of protein.

Energy Requirements.

At birth, the calf has a small stomach, the rumen being undeveloped and all food material being passed direct to the abomasum or fourth stomach. For this reason, it requires its food in concentrated form. As the rumen develops, more and more feed of a roughage nature can be eaten. Thus, during the first few days milk alone is digested. After about two weeks, the calf will begin to eat a little grain and pick at pasture and hay; but it is not until it is six to eight months old that it will thrive on roughage feeds alone.

Mineral and Vitamin Requirements.

At birth, the young calf is deficient in vitamin A. The chief role of this vitamin is to protect against infection. It is important, therefore, to ensure that adequate supplies are available. Best sources are in mother's colostrum; other good sources are green pasture, rich green lucerne hay and yellow maize.

Several mineral elements are essential for normal development of the calf, but those which require special attention on the part of the calf feeder are calcium (lime) and phosphorus. Both are adequately supplied by milk, but if milk can only be given in limited quantities it may be necessary to feed either ground limestone for lime or bone meal for a supply of phosphates. Foodstuffs rich in lime are lucerne hay and good pasture; in certain localities pastures may be low in phosphates. Grains are usually rich in this mineral.

HANDLING THE VERY YOUNG CALF.

The cow near calving should be separated from the herd and placed in a small well-sheltered paddock handy to the milking yards. When the calf is born, it should be examined to see that it is normal and then left alone in the paddock with the mother for 24 hours. If the mother is a heavy milker, she should be milked out three times during the first day in order to ease the pressure and inflammation in the udder and reduce the risk of mastitis.

After about 24 hours, the calf should be taken from the mother and taught to feed from a bucket. It may either be placed in a small pen or else tied with a collar and chain in a grassy spot. During inclement weather, it is necessary to provide some protection from wind and rain, but normally the calf should be raised under natural conditions, with plenty of direct sunlight and only sufficient shade to form a cool camp.

The housing of young calves of varying ages in one large pen is bad and this type of husbandry is frequently responsible for great loss from disease. The very young calf is particularly susceptible to infection and it must be treated accordingly.

It is essential that the newborn calf receives mother's milk for the first four or five days. When born, the young animal has no reserves of vitamins. The mother's colostrum is equipped to provide these as well as minerals, protein and important antibodies which provide the calf with resistance against infection. If colostrum is not fed, it is almost impossible to raise a calf which does not develop scours or pneumonia.

Quantity of Milk to Feed.

The most common mistake in feeding young calves is to over-feed. It should be borne in mind that the newborn calf has only a very small stomach. If this stomach is filled beyond its normal capacity, digestive upsets will occur and the calf will develop scours.

The amount to be fed will vary from three-quarters of a gallon to one gallon according to the size of the calf.

How to Feed Milk.

It is better to feed three times a day for the first 10 days, but if this is not possible then the two feeds should be spread at equal intervals. Feeding at intervals of 8 and 16 hours, as is frequently done, is a bad practice and one likely to end in disaster.

Milk should be fed at blood heat. In the case of colostrum and mother's milk, it will be fed directly after milking, but when bulk milk is being fed it may be necessary to warm it before feeding. After 4 to 6 weeks, cool milk is suitable, provided it is quite fresh and clean.

Whole milk should be fed for the first seven days to all calves. Strong animals may then be weaned gradually on to separated milk. In the case of more delicate calves, whole milk should be continued for a few more days and in some cases even up to a fortnight or longer.

When feeding whole milk, it should be diluted with boiling water to reduce the butterfat content to between 3 and 3.5 per cent.

The diluted milk is more easily digested because of the formation of a soft curd within the stomach. Milk which is too rich frequently forms a hard, indigestible curd.

Each 10 pounds of milk should be diluted according to the fat content. The following method has been suggested by Hewitt in Victoria:—

To each 10 lb. of 3 per cent. milk, add no water;
To each 10 lb. of 3.5 per cent. milk, add no water;
To each 10 lb. of 4 per cent. milk, add 1½ pounds of water;
To each 10 lb. of 4.5 per cent. milk, add 3 pounds of water;
To each 10 lb. of 5 per cent. milk, add 4½ pounds of water;
To each 10 lb. of 5.5 per cent. milk, add 6 pounds of water.

Thus for each 0.5 per cent. increase in butterfat content over 3.5 per cent., add 1½ pounds of water to each ten pounds of milk.

For the first six or eight weeks of life there is no complete substitute for milk, though after 10 weeks of age calves can obtain sufficient nutrients for normal growth from pasture, hay and concentrates.

In the case of weak calves, it is often useful to add a little lime water to each milk feed. This will prevent the formation of a solid curd in the gut.

Necessity for Cleanliness.

When feeding bulk separated milk, it is essential to be certain that the milk is not contaminated by unsterilized containers. The practice of running all separated milk into an old 44-gallon drum, and dipping out of this for the calf feed before feeding the remainder to pigs, cannot be too strongly condemned. Calves taken from their mother and raised artificially are delicate creatures and only the best hygiene and sanitation will be sufficient to avoid a breakdown.

Various Methods of Calf Raising.

Where stud calves are being raised for Show purposes and cost is no object, whole milk may be fed for the first 12 to 15 weeks of life. Reduce to a butterfat content of between 3 and 3.5 per cent., as explained previously. Calves on this ration will grow actively and vigorously. Good calves may also be reared on foster mothers, but this method has only limited application. A good foster mother under normal Queensland conditions should raise five or six calves during each lactation. The cow should be restrained for each feed until she accepts the new calf. After 12 weeks, fostered calves can be taken from the cow and replaced by young animals.

However, the common method of raising calves is on a diet consisting chiefly of skim milk. Two other important methods in Queensland are whey feeding, in cheese making districts, and minimum milk feeding in districts where whole milk is produced.

SUPPLEMENTARY FEEDING STUFFS.

The important supplements to be fed in addition to milk or whey are pasture, hay, grain and, to a lesser extent, protein-rich concentrates.

Pasture.

Pasture forms the chief supplement in normal calf-raising methods on Queensland farms. Good pasture is cheap and contains adequate nutrients to balance the milk diet. If immature, rapidly growing pasture is available, it may be used to replace all hay recommended in

the ration, and after the first 12 weeks calves will thrive on milk and good quality pasture without a grain ration. However, if good pasture is not available, some hay should be fed and the grain ration should continue until calves have matured sufficiently to ensure that they are capable of dealing with roughage containing a high fibre content.

After the initial training period, which lasts two or three weeks, calves should be placed in a well-grassed paddock where they have ample shade and fresh water and constant access to good grazing. It is desirable that facilities should be available for rotational grazing of such paddocks or of alternating young stock with mature cattle. Constant stocking with young animals leads to heavy contamination with eggs and larvae of internal parasites.

Hay.

In the absence of good grazing, some hay is essential if the calf is to make normal growth. Good lucerne hay will supply large quantities of protein, calcium and vitamin A, three food constituents essential to health and growth.

In the absence of pasture, calves should have constant access to good hay. It is unwise to limit the intake of roughage. At about 4 weeks, the normal calf will eat approximately 1 lb. of hay per day; 3 lb. at 3 months and about 5 lb. at 6 months.

If good quality hay is available on the farm, it may be used to replace some of the grain portion of the ration. However, overfeeding on rich leafy lucerne hay will sometimes scour calves.

Concentrates.

Grain forms the bulk of most concentrate meals fed to calves; and, indeed, if adequate milk is available, protein-rich concentrates are not required, as the milk-grain ration is quite well balanced. However, if extra protein meal is available at cheap rates, there is no reason why it should not be fed.

Cracked or crushed grains alone are sometimes slightly unpalatable, and in order to increase palatability it is wise to add a little bran or peanut meal to the mixture if these are available.

Even if good pasture is available, calves will thrive better if given some grain in their ration. The amount fed will depend to some extent on the availability and price, but when grain can be grown on the farm it is profitable to feed it in relatively large quantities.

Calves should be started on grain as soon as they begin to cud—at about three weeks of age.

It is wise to feed the grain ration immediately after the milk drink, as this avoids bolting of the mixture and also lessens the tendency for calves to suck one another when the milk is finished.

Most grains are of equal value as calf foods, and farmers should be guided only by availability and price when making their selection of a grain to feed. Yellow maize has an advantage in that it contains vitamin A, but in ordinary circumstances this vitamin will be supplied by the pasture.

The grain should be ground into a coarse meal rather than to a flour.

In areas where molasses is available cheaply, it may be used as portion of the concentrate meal. To avoid scouring, start with small quantities. As little as one ounce per day, mixed with grain, is sufficient. Build this up, gradually, until a maximum of about 2 lb. per day is fed at six months. It is advisable to avoid molasses in the case of whey feeding.

Protein-rich meals and mill offals are necessary in the concentrate ration when there is insufficient milk.

Where no milk protein is fed, animal protein in another form must be fed for the first 12 weeks, after which time calves are capable of obtaining their full protein requirements from vegetable sources.

TABLE 1.

Grain Mixtures for Young Calves.

Grain and Concentrate.	10 to 12 Per Cent. Protein. (Calves on Adequate Milk).			14 to 16 Per Cent. Protein. (Calves on Limited Milk).			18 to 20 Per Cent. Protein. (Calves on Whey or Meal.)		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
Corn	1	1	1	2	2	1	2	1	1
Sorghum	..	1	1	2	2	1	1	..	1
Pollard	..	..	1	..	2	..	1	2	1
Bran	..	..	1	1	1	1	1	1	1
Linseed Meal ..	..	..	..	1	1	1	4	2	2

Table 1 (adapted from the United States Department of Agriculture Year Book for 1939) sets out suggested concentrate rations suitable for feeding with adequate milk, limited milk, and whey or meal. Under A, B and C, three mixtures in each group are suggested.

Calves getting adequate skim milk require a concentrate ration containing only 10 per cent. crude protein. If the quantity of milk is limited, the protein content of the concentrate should be increased up to about 15 per cent. On a basic ration of whey or when minimum milk is to be used and calves are raised largely on whey or meal, then 18 to 20 per cent. of crude protein is required.

The maize and oats in the table may be replaced wholly or in part by other grain, and linseed meal may be replaced wholly or in part by other protein meals provided the equivalent amount of crude protein is supplied. Linseed meal, however, has the advantage of being highly palatable, a feature which is not shared by meatmeal or blood meal, which at the moment are more readily available in Queensland.

Table 2 sets out the food values of the various concentrates likely to be available in Queensland.

RAISING CALVES ON SKIM MILK.

The normal routine described previously is carried through for the first two weeks. The calf is left with the mother for 24 hours, weaned into isolation, fed mother's colostrum for three or four days, then whole milk for a varying period, according to strength and development, and gradually weaned on to skim milk fed at the rate of about 1 lb. of milk for each 10 lb. weight of calf.

After the initial isolation period of two to three weeks, the calf is placed in the calf paddock with other calves of varying age. Individual feeding should be continued either by the bail system or in open buckets held for each calf by the feeder.

The bail system has several advantages. A small concrete yard can be built and calves can be shut in and controlled for routine operations such as drenching for parasite control and Strain 19 vaccination. Each calf enters the bail; the yoke is closed and held securely until all animals have finished their drink. Provided enough bails are available, it is as well to feed the grain ration in the bail immediately the milk drink is finished. This ensures that all calves get their share of grain.

Fresh warm milk direct from the separator should be fed, if possible; otherwise it should be warmed to blood heat before feeding to younger calves.

When an ample supply of milk is available, calves should be fed at the rate of about one pound of milk to every 10 pounds weight of the calf, to a maximum of about one-and-a-half gallons a day. Overfeeding must be avoided just as carefully as underfeeding.

As soon as the calf is allowed free range, it should have access to first quality grazing or, failing that, good lucerne hay; if neither grazing or hay is available, a greater quantity of grain can be fed.

If grain is home grown and cheap, it should be made available as a meal, and the calf allowed all that it will eat up to a maximum of about three pounds. Where grain is not so cheap, the ration should be restricted accordingly. Cracked grain alone contains sufficient protein for the calf being raised on skim milk, but if milk becomes scarce the protein percentage of the ration should be gradually increased by the inclusion of protein-rich concentrates as the milk feed is reduced.

TABLE 2.

AVERAGE FODDER VALUE OF COMMONLY USED CONCENTRATE FOODS.

Concentrate.	Food Units Per 100 Lb. (Starch Equivalent).	Digestible Crude Protein Per 100 Lb.
Energy–Rich Concentrates.		
Barley	71	7
Maize	77	8
Oats	61	8
Sorghum	76	7
Wheat	72	8
Bran	56	10
Pollard	66	10
Molasses	50	0
Whey	6	0
Whey, dried	85	12
Protein–Rich Concentrates.		
Blood Meal	63	68
Meatmeal	80	55
Meat and Bone Meal	60	45
Peanut Meal	78	43
Cottonseed Meal	67	33
Linseed Meal	72	25
Whole Milk	20	3·5
Fresh Separated Milk	8	3·5
Dried Separated Milk	80	30
Fresh Buttermilk	9	3·5
Dried Buttermilk	85	32

RAISING CALVES ON WHEY.

In cheese producing districts of Queensland, skim milk is frequently scarce and there are plentiful supplies of whey available from the cheese factory. Provided whey is treated hygienically and not adulterated with wash water and condensed steam, it constitutes an excellent basis on which to build the daily calf meal.

There is some difficulty in many localities in obtaining good quality whey, and wherever difficulty is being experienced by the farmer in raising calves on whey some consideration should be given to inspecting the source of the product at the factory. Naturally, contamination and dilution not only reduce the food value of the resultant product but also increase the tendency of the whey to produce scours.

For the first three weeks, the calf is raised in the same manner as is the case with the calf intended for skim milk feeding. At the end of this period, the change-over from milk to whey should be a gradual one, taking about two weeks to complete. Even good quality whey has a tendency to scour young calves and any sudden change from milk to whey is likely to accentuate this tendency.

Whey is low in protein and has a much lower energy value than skim milk. It is therefore necessary to feed a high-protein calf meal as a supplement to whey. Initially, the meal should contain 18 to 20 per cent. crude protein, but as the calf matures this may be reduced to 16 per cent. crude protein.

Calves over two months of age may be given up to a maximum of one-and-one-half gallons of whey per day along with good quality lucerne hay and a concentrate mixture.

Feeding will follow the same pattern as skim milk feeding, except that a little more of a higher protein content mixture will be fed.

Suitable concentrate supplements may be prepared in any of the following ways:—

30 parts of crushed grain (maize, sorghum or barley) plus 30 parts of pollard or brain, plus any one of the following:—

17 parts of blood meal, 20 parts meatmeal, 22 parts peanut meal, 25 parts cottonseed meal *or* 30 parts linseed meal.

Some wheat and some oats may be substituted for part of any of the grains listed, but wheat should not constitute more than one-third of the grain ration. Oats is especially valuable as a grain if blood meal or meatmeal is used, as it increases the palatability of the ration. Grains should not be finely ground but fed either rolled or crushed.

So far as the protein concentrate is concerned, it is better to dilute the blood meal and meatmeal with one of the more attractive meals if possible, as this increases the palatability.

RAISING CALVES ON LIMITED QUANTITIES OF MILK.

On farms supplying whole milk for city milk consumption, it is not profitable to use more than a few gallons of milk for calf food. Forttunately calves will thrive quite well on meals, provided they receive colostrum and mother's milk for a few days and then decreasing

amounts of skim milk from the herd to the eighth to tenth week. During the first few weeks after milk feeding is suspended, it is desirable that the calf meal should contain some animal protein.

For very young calves there is no substitute for milk, and if calf meals are used to replace milk at too early an age, scours and digestive disorders are certain to occur.

After the calf is two to three weeks old, calf meals can be used to replace increasing amounts of milk, and whole milk may be replaced by skim milk.

Age alone is insufficient indication for reducing the amount of milk in the diet. Greater consideration should be given to the development and thriftiness of the calf.

Well-grown calves may be completely weaned from milk between the seventh and eighth week. After weaning they will thrive on dry calf meals provided they have access to good quality lucerne hay or good grazing with adequate water supply.

Whilst the milk is being reduced, extra water should be added to keep the fluid intake at approximately the same level. If this is not done, very young calves may not drink enough water for normal requirements.

The meal may be fed dry, as a gruel or as reconstituted milk. The method of feeding is one of personal choice, as calves will thrive equally well on all three methods. However, considerable labour is saved if the calf is educated to take the meal in a dry state, though frequently it is difficult to accustom calves to the meal in this way.

Calves raised on limited quantities of milk frequently do not grow as well as milk-fed calves during the first six months, but they will reach normal weight by the time they are 12 months old, provided good pastures are available.

Calves raised on meal may be fed according to the following system:—

Normal methods of colostrum and whole milk feeding for two weeks. Calves which are not strong and healthy at the end of this period should continue on milk. Healthy calves can be started on meal just as soon as they will eat solid food.

Reduce the milk allowance as more and more meal is taken. For example, during the 4th week, feed 9 lb. of milk, in the 8th week, 8 lb. of milk, 6th week, 7lb. of milk, and so on until the calf is three months old. Allow it all the meal it will eat up to three or four pounds a day along with good lucerne hay as grazing.

After four months, the protein content of the meal can be reduced and the calf may be raised on grain and lucerne hay or first-class grazing.

For the young calf the protein content of the meal is important. Calves of 100 lb. liveweight will eat about 2½ lb. of meal and need 0·40 lb. of digestible protein a day. The meal, therefore, should contain in the vicinity of 20 per cent. crude protein. It is preferable to include a small quantity of animal protein, such as meatmeal, blood meal or skim milk powder, in the meal.

TABLE 3.

FEEDING PLAN ON SEPARATED MILK—Pounds of Food per Day.

Age of Calf.	Whole Milk.	Separated Milk.	Concentrate.	Hay.
1 to 2 days ..	Calf on mother			
2 to 5 days ..	Mother's milk and colostrum at 1 lb. to each 10 lb. body weight			
5 to 10 days ..	Whole milk at rate of 1 lb. to each 10 lb. body weight			
10 to 14 days ..	Change from whole to separated milk at same rate			
3rd week ..	..	10	A trace	Free access
4th week ..	..	10	0·25	do.
5th week ..	..	10	0·50	do.
6th week ..	..	12	0·75	do.
7th week ..	..	13	1·00	do.
8th week ..	..	13	1·00	do.
9th week ..	..	13	1·00	do.
10th to 14th week	..	14	2·00	do.
14th to 24th week	..	16	3·00	do.

TABLE 4.

FEEDING PLAN ON WHEY—Pounds of Food per Day.

Age of Calf.	Whole Milk.	Whey.	Concentrate.	Hay.
1 to 2 days ..	Calf on mother .. .			
2 to 5 days ..	Mother's milk and colostrum at 1 lb. to each 10 lb. body weight			
5 to 10 days ..	Mixed whole milk at rate of 1 lb. to each 10 lb. body weight			
10 to 14 days ..	ditto			
3rd week ..	10	..	A trace	Free access
4th week ..	7	3	0·25	do.
5th week ..	3	8	0·75	do.
6th week ..	..	13	1·00	do.
7th week ..	..	13	1·00	do.
8th week ..	..	14	1·50	do.
9th week ..	..	14	1·50	do.
10th to 14th week	..	14	2·00	do.
14th to 24th week	..	16	3·00 to 4·00	do.

TABLE 5.

FEEDING PLAN ON MEAL—Pounds of Food per Day.

Age of Calf.	Whole Milk.	Water.		Concentrate.	Hay.
1 to 2 days ..	Calf on mother	Dilute whole milk with water to maintain fluid bulk.			
2 to 5 days ..	Mother's milk and colostrum at 1 lb. to each 10 lb. body weight				
5 to 10 days ..	Mixed whole milk at rate of 1 lb. to each 10 lb. body weight				
10 to 14 days ..	ditto				
3rd week ..	10				
4th week ..	10			0·25	
5th week ..	8		2	0·50	Free access
6th week ..	5		3	0·75	do.
7th week ..	5		3	0·75	do.
8th week ..	3		4	1·00	do.
9th week ..	2		5	1·50	do.
10th to 14th week	0			2·50	do.
14th to 24th week	0			3 to 5	do.

Tables 3–5 set out the rations for an average A.I.S. calf from birth to six months of age. Such a table should be taken as a guide only. It will be accurate only under average conditions, and alterations will be necessary according to the health and development of the calf. Modification will also be necessary for breeds other than A.I.S. Obviously, the best basis for rationing is according to body weight rather than age. The average Jersey calf weighs in the vicinity of 50 to 55 pounds at birth; the average for other breeds are:—Ayrshire and Guernsey, 65 pounds, A.I.S. 70–75 pounds and Friesian, 90 pounds.

The hay ration may be entirely replaced by grazing, but in the absence of green grazing it may be necessary to supply some other form of vitamin A. If calves are given free access to hay as suggested, it will be found that they eat about one pound at four to six weeks, three pounds at three months, and about five pounds at six months.

ASTRONOMICAL DATA FOR QUEENSLAND.

FEBRUARY.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.21	6.42	Cairns	41	17	Longreach ..	40	30
6	5.24	6.40	Charleville	29	25	Quilpie	34	36
11	5.28	6.36	Cloncurry	57	42	Rockhampton ..	15	5
16	5.32	6.32	Cunnamulla ..	28	30	Roma	18	16
21	5.35	6.28	Dirranbandi ..	18	20	Townsville ..	34	16
26	5.38	6.23	Emerald	24	14	Winton	46	34
28	5.39	6.21	Hughenden ..	42	27	Warwick	3	5

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	a.m.	p.m.
1	7.45	8.42
2	8.37	9.09
3	9.28	9.36
4	10.20	10.04
5	11.13	10.33
	p.m.	
6	12.08	11.07
7	1.07	11.46
8	2.08	..
		a.m.
9	3.10	12 32
10	4.12	1.26
11	5.09	2.29
12	6.01	3.37
13	6.47	4.48
14	7.28	6.00
15	8.04	7.09
16	8.39	8.17
17	9.14	9.23
18	9.51	10.28
19	10·31	11.34
		p.m.
20	11.15	12 38
21	..	1.42
	a.m.	
22	12.04	2.41
23	12.57	3.36
24	1.54	4.24
25	2.52	5.06
26	3.49	5.43
27	4.45	6.15
28	5.39	6.44

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4;

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	23	16	39	32	14	8	45	36
6	13	26	28	42	3	18	32	50
11	10	30	25	45	0	21	27	54
16	20	19	36	35	11	10	42	41
21	30	9	46	24	21	0	53	26
26	27	13	43	28	18	2	51	31
28	24	15	40	31	15	7	46	35

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	38	23	56	45	41	30	32	20
3	28	32	50	53	34	38	24	28
5	19	42	42	59	27	44	17	36
7	9	51	37	64	21	50	8	43
9	3	58	34	66	18	51	4	44
11	5	56	35	67	19	53	5	46
13	13	47	39	62	24	47	12	39
15	26	36	47	55	32	40	22	31
17	38	24	56	46	41	31	32	21
19	48	11	63	38	48	23	40	11
21	55	3	68	32	51	18	45	4
23	56	2	68	32	52	17	46	3
25	53	7	67	35	50	21	44	8
28	40	21	57	44	42	29	33	18

Phases of the Moon.—First Quarter, 6th February, 6.05 p.m.; Full Moon, 13th February, 7.08 p.m.; Last Quarter, 20th February, 10.43 a.m.; New Moon, 28th February, 6.55 a.m.

On 15th February the Sun will rise and set 15 degrees south of true east and true west respectively, and on the 2nd and 16th the Moon will rise and set approximately at true east and true west respectively.

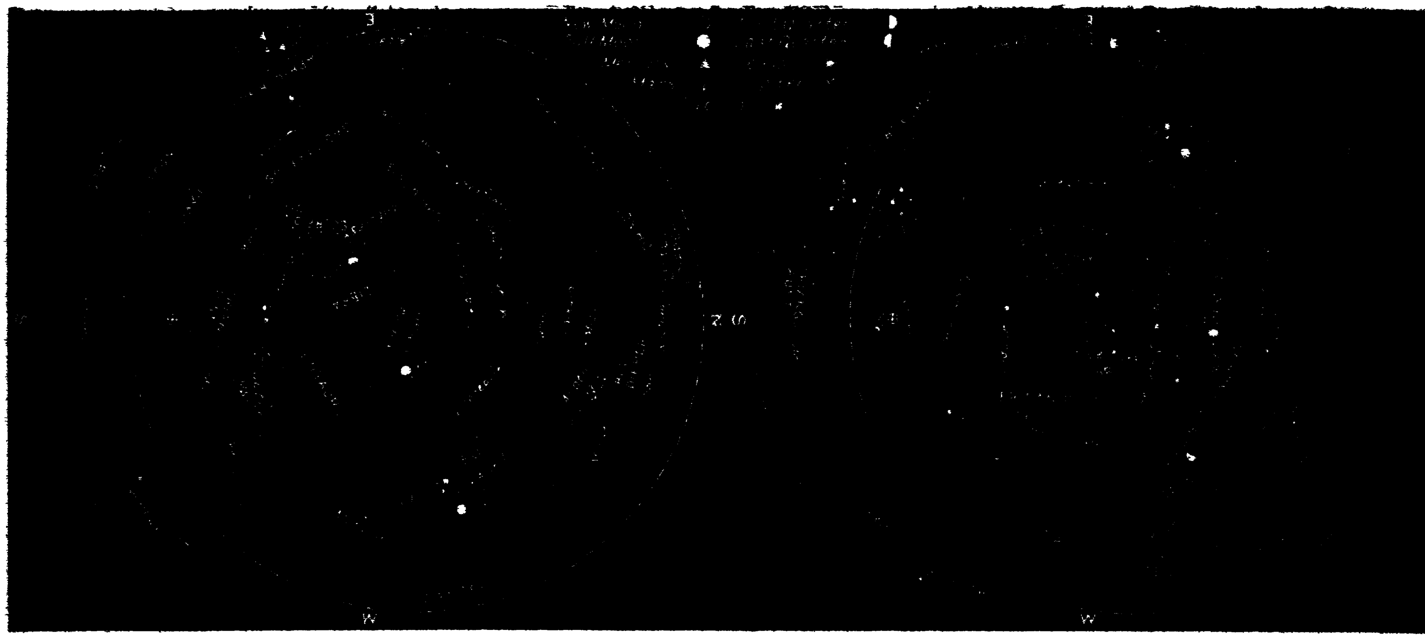
Mercury.—Will be in line with the Sun on the 2nd, after which it will become a morning object and on the 28th, in the constellation of Capricornus, will reach greatest angle west of the Sun when it will rise 2 hours before sunrise.

Venus.—At the beginning of the month, in the constellation of Sagittarius may be seen low in the east during morning twilight, when it will rise about 1½ hours before the Sun. After passing through the constellation of Capricornus, by the end of the month it will be too close in line with the Sun for observation.

Mars.—Too close in line with the Sun for observation.

Jupiter.—In the constellation of Sagittarius. At the beginning of the month will rise 1 hour 53 minutes before the Sun and by the end of February will rise between 2 a.m. and 3.15 a.m.

Saturn.—In the constellation of Leo, will be opposite the Sun on the 21st and thus favourably placed for observation throughout the night during this month. On the 1st it will rise a little over an hour after sunset and by the end of the month will rise about ½ hour before sunset.



Star Charts:—The chart on the right is for 8 15 p m in the south-eastern corner of Queensland to 9 15 p m. along the Northern Territory Border on the 15th February (for every degree of Longitude we go west, the time increases by 4 minutes) The chart on the left is for 8 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales Border, when facing north hold "N" at the bottom, when facing South hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named The stars, which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days When no date is marked the position is for the middle of the month